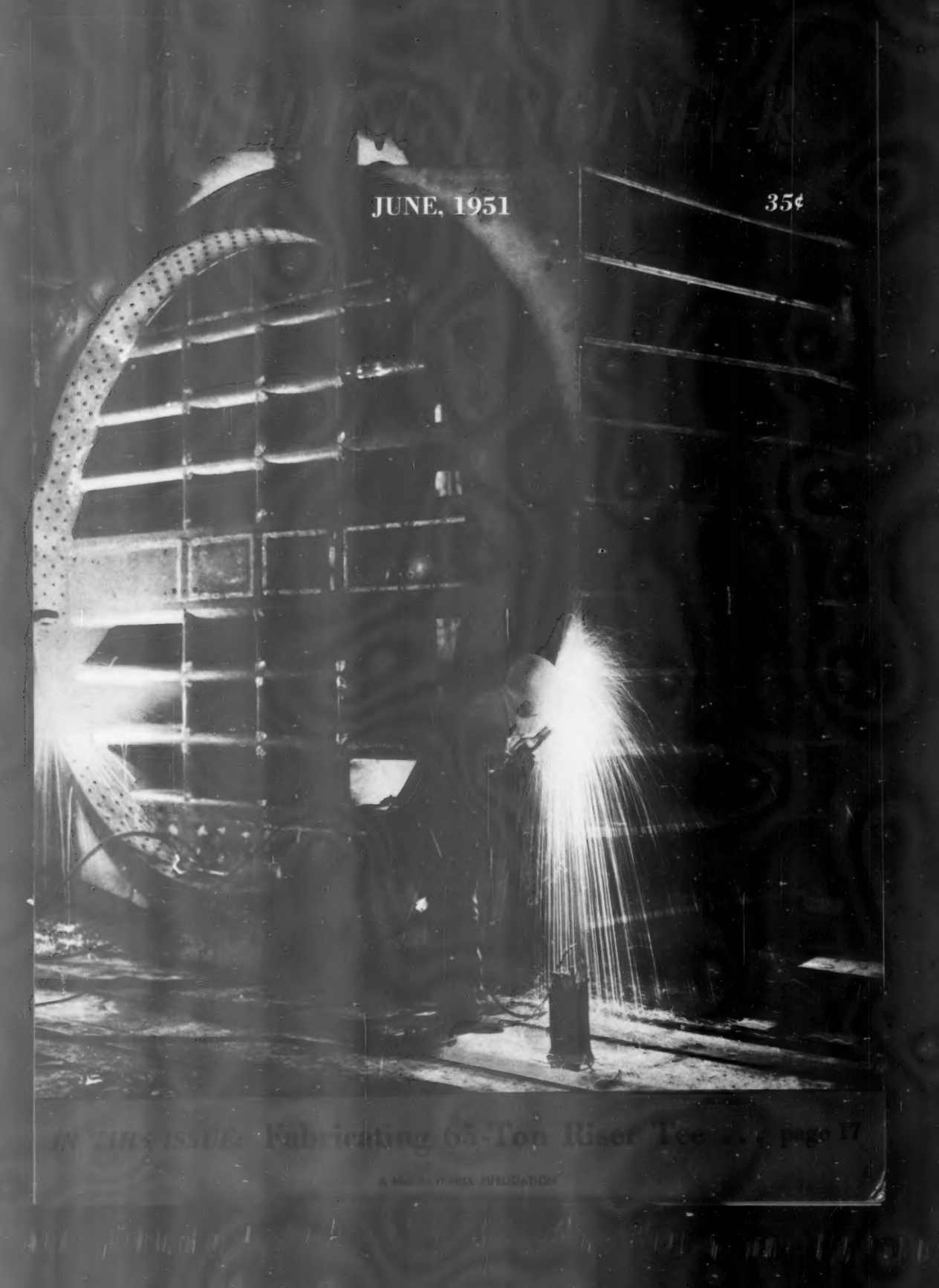
JUNE, 1951 35¢



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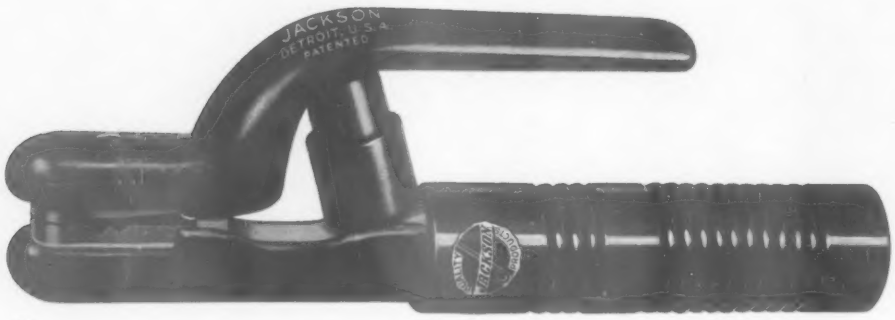

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A·W

Takes Electrodes including 1/4"
300 amps. • 9¼" long
WEIGHT 14 OZ.

Wherever a lightweight holder is preferred, you will find one of these two holders on the job, doing 300 to 400-amp. work with the greatest ease, with only a minimum of fatigue.

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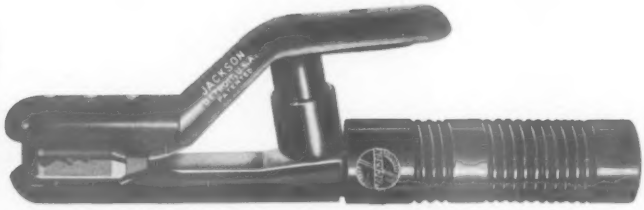

MODEL

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Takes Electrodes including 5/16"
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WEIGHT 21 OZ.

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QUALITY JACKSON PRODUCTS

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on wheels!

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It's ideal for sheet metal work . . . has low penetration and fast working characteristics.

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Rectifier Welders

THE WELDING ENGINEER

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VOLUME 36 NUMBER 6

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JUNE, 1951

COVER: *Weldors at work on massive 65-ton steel riser for the Fort Peck dam in Montana. Fabrication was at the South San Francisco plant of Consolidated Western Steel Corp., a U. S. Steel subsidiary. The unique grid design was specified by the U. S. Army Engineers. More details beginning on page 17.*

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NEWS FROM WASHINGTON

Electrodes and Rods Get Top Priorities

Two NEW priority ratings authorized by NPA on May 14 will assure an adequate supply of critical materials for machine tools, related equipment and component parts in the third quarter. Covered are arc-welding electrodes, gas-welding rods and resistance-welding equipment and electrodes.

Order M-60 provides rating DO-70 and covers arc-welding electrodes and gas-welding rods. Order M-61 provides rating DO-75 and covers resistance welders, components and electrodes. Percentages permitted of base period production are 105% for steel, 100% for copper and 95% for aluminum products. The base period to be used is the first quarter of 1951, which was a very good period for the welding industry. Stud-welding studs should be considered under arc-welding electrodes.

Both orders are considered interim measures until CMP becomes fully effective. To extend this rating, manufacturers must write on their order "Certified under NPA Reg. 2 and Order M-60 (or M-61)."

Seven Regulations for Operating CMP

CONTROLLED MATERIALS Plan will start on July 1, 1951. However, it may take some time before it is operating smoothly. Lists of direct defense production items ("A") and the defense-supporting ("B") items have been prepared and estimates of both "A" and "B" producers are being gathered. Aim is, of course, to match the supply against the requirements for the controlled materials.

Application forms CMP4-B ("B" list) have been circulated to more than 50,000 manufacturers to list their requirements for the third quarter. These are said to represent about 90% of all metal-working plants.

The following seven regulations to be issued will govern CMP: CMP Reg. 1—General Rules; Reg. 2—Inventories; Reg. 3—Preference Ratings; Reg. 4—Warehouses; Reg. 5—Maintenance, Repair and Operating Supplies; Reg. 6—Construction; and Reg. 7—Repair Shops. To date, Regulations 1 through 4 have been issued.

After the "A" and "B" requirements have been taken care of, the remaining "free supply" materials will be scrambled for by the large non-essential consumer goods group.

Steel for Cars Cut Back in June

ORDER M-47, as amended on May 4, has reduced the use of steel in passenger automobiles and station wagons to 75% of the rate of use during the first six months of 1950. The previous reduction had been to 80%. Cut-backs have so far had no appreciable effect on production, which has continued at a high level. Plans for the 1952 models are well along in the works.

Free Booklet on "ABC's of CMP"

A NEW 16-page booklet has been issued by NPA to spread information about the Controlled Materials Plan. It should be valuable as background material on what CMP is and how it will work.

The booklet describes CMP fundamentals, regulations, definitions and materials; how the plan will operate; where industry and government fit in; the classification of products; and the extent of the program.

You can get a copy by writing to NPA Information, Department of Commerce, Washington, D. C., or from your local Department of Commerce field office.

Tighten MRO due to Abuses of DO-97

RECENT amendments to NPA Reg. 4 have made it more restrictive because of the apparent misuse of the priority for maintenance, repair and operating supplies. Also, many more items have been added to the list of prohibitions.

NPA stresses that DO-97 ratings are not for the building up of inventory stocks. Some wholesalers and distributors, anticipating DO-97 orders from their customers, are said to have been building up their stocks in advance by extending the DO-97 rating prematurely to their own suppliers. This is a violation.

Compliance with the regulation is being checked, says NPA, by Federal Trade Commission investigators, who are now checking representative cross-sections of about 800 different industries.

Shortage Critical in Structural Steel

DEFENSE expansion has been demanding so much structural steel, NPA Administrator Fleishmann warns, that the material may have to be brought under complete allocation. Many firms have already put aside their 1951 expansion plans. To conserve steel for defense and essential civilian uses, NPA is requiring that contractors get specific permisson to erect homes costing more than $35,000, apartment houses exceeding three stories, and construction projects requiring more than 25 tons of steel.

An easy way to save about 10% of the steel needed would be to specify welded construction.

Civilian Aluminum Allotment Retained

PRODUCERS and assemblers of 200 aluminum consumer items are permitted in May and June to use 50% as much aluminum as they used in the average month during the first half of 1950, by an amendment to Order M17, issued April 20. These items were to have ceased production on May 1, according to the previous order.

In another amendment to M-7, issued May 1, covering civilian use of aluminum, manufacturers of certain types of prime aluminum

NEWS FROM WASHINGTON (Continued from page 5)

windows and frames are to be permitted, during May and June, to use 65% of their monthly average consumption of the metal during the first half of 1950. Prior to the amendment, manufacturers of non-residential type windows were not permitted to use aluminum during May and June except to complete orders received prior to February 20, 1950.

The 65% permissible use of aluminum under this amendment applies to window-screen frames, ledger openers, residential type windows and non-residential type windows.

Class "B" Products Directory Available

A PRODUCT Assignment Directory recently issued by NPA lists alphabetically about 13,000 items, and indicates the NPA industry division handling each product. Listed are all the economically significant products in the United States except foods, animal and vegetable oils, tobacco and petroleum products.

Also included with the directory is the Class "B" products list, announced a week earlier by NPA for the Controlled Materials Plan. The "B" list covers more than 4,000 manufactured articles containing steel, copper and aluminum.

Both are available at NPA headquarters in Washington and from local field offices of the Department of Commerce.

Welding under CPR-30 Machinery Price Order

OPS ON MAY 4 issued its supplementary regulation CPR-30 for machinery to the general manufacturers price order CPR-22. Welding equipment and supplies are among the items covered. Distributors and resellers ceiling prices are not covered by CPR-30 but one is planned for early issuance.

In general, CPR-30 is expected to result in a price rollback. It resembles CPR-22 very closely and permits machine makers to add increases in material and labor costs to preKorean prices in effect during optional base periods—either from April 1 to June 24, 1950, or any one of three previous calendar quarters.

Although the effective date of the order is May 28, the large amount of work involved in the recomputing of base period prices and additions found many unable to comply in the specified time. About 75,000 manufacturers are estimated to be covered by this order. Not covered are used machinery or rentals of equipment.

Order CPR-30 and its explanation sheet OPS-TP-6 can be gotten by writing to Office of Price Stabilization, Tempo E, Washington, D.C.

Copper Users Are Required to Report

MONTHLY reports covering the use of copper and copper-base alloys will be required from all companies using these materials, NPA has announced. The reports, commencing with April's, are to be filed on the 15th of each month following the month of operations. This is considered a necessary step in making allotments of copper products under the Controlled Materials Plan.

Two types of reports will be required of brass mills, copper wire mills, and brass and bronze foundries. Such other users of copper as electrotypers, alloy producers, chemical plants, miscellaneous users, and dealers who own refined copper will also report.

Most known users of copper have already received their report forms. Those who have not should write for forms to the Copper Division, Metals and Minerals Bureau, National Production Authority, Washington, D. C.

Welding Rods Exempt in Cobalt Limitation

WELDING RODS are not subject to the restrictions on columbium and tantalum, limited in alloy steels by NPA order to a total content not over eight times the content of the carbon.

An amendment to NPA Order M-3, issued May 11, continues the old restriction except where an order requiring a higher ratio does not constitute a full single-heat lot. In such cases, the full heat may be made at the higher ratio, even though the added steel was not ordered to meet the higher regulations.

These relaxations in the order are intended to assure higher production of steels containing columbium or tantalum.

Welded Boiler Tube "Set-Aside" Increased

NPA WANTS more boiler tubes. The Welded and Seamless Steel Tubing Industry Advisory Committee was urged to achieve increased output of boiler tubes for the defense electric power expansion program to an amount 80% greater than its output during the first quarter of 1951. To aid in this expansion, NPA has issued supporting directives to the steel producers to supply the needed steel.

To assure more boiler tubes in June, the industry was ordered to increase the amount of tubing set aside for defense-rated orders to 30% instead of the former 10%.

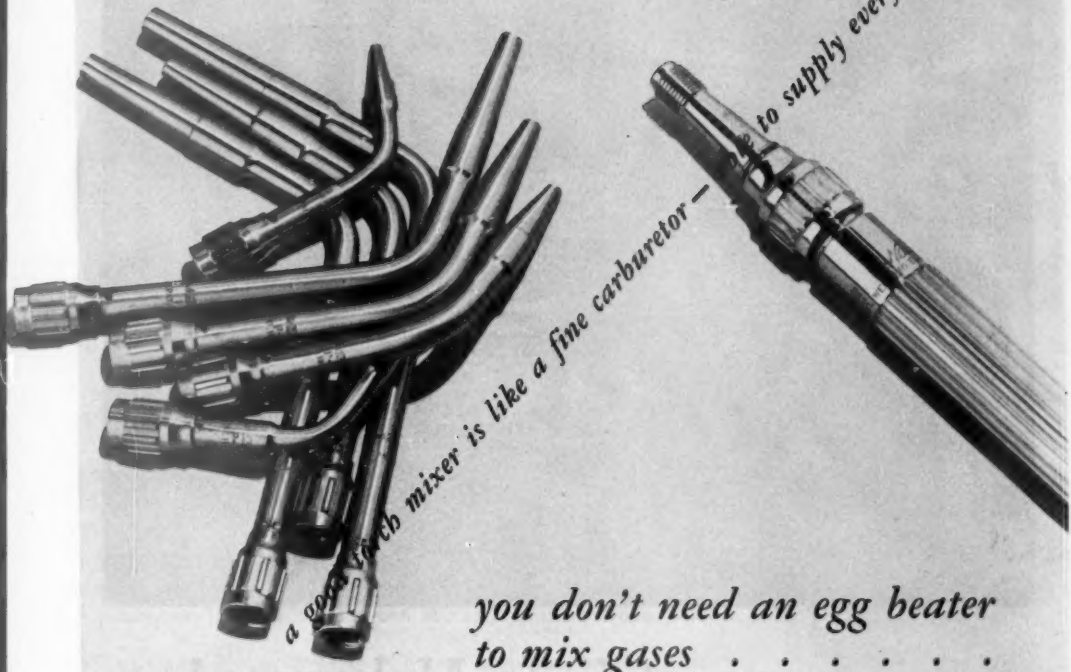
Farm Equipment Production Assured

CONTINUED production of essential farm equipment during July, August and September has been assured by NPA order M-55A issued on May 11.

It permits farm equipment production in the third quarter at the same rate as the third quarter of 1949. It also authorizes manufacturers to use priority rating DO-87 to obtain 92% of 1951 third quarter requirements of steel, copper, aluminum, zinc and component parts.

Companies apply or extending DO-87 ratings must write on their order: "Certified under NPA Order M-55A and NPA Regulation 2."

gases are just naturally good mixers . . . . . .



a good torch mixer is like a fine carburetor — to supply every gas need

you don't need an egg beater to mix gases . . . . . .

Patented by National

Gases are self mixing—all they need is a chance to do what comes naturally.

A gas molecule at room temperature moves at bullet speed—ever colliding with its neighbors—ever intermingling and mixing.

The more important function of a good torch mixer is to prevent flash-backs and backfires.

A good torch mixer is like a good carburetor—able to supply every gas need for the full operating range of your torch.

This is the simple, sensible, economical function of the new NATIONAL "multiple mixer"—one mixer instead of many—one low purchase price and high operating efficiency.

FREE *An interesting bulletin explaining the nature of gases—how they move and intermingle. Write for it today.*

508

Made by National SINCE 1910 **WELDING EQUIPMENT CO.,** San Francisco 5, California

X-RAY LAB ON WHEELS

brings mountain to Mohammed

X-RAY

If it's impractical or impossible to check your welds with a stationary x-ray unit, investigate the production-proven advantages of the GE Mobile OX-250. By far the most popular industrial radiographic unit to come out of World War II, it meets today's defense requirements with added features to speed up weld inspection.

Its compact "head," enclosing *all* high-voltage elements, is highly maneuverable. Its quarter-million volt x-ray output assures ample power for thorough, rapid weld penetration. Wheel it where needed or carry it above congested work areas by its crane ring — it's ready to go to work instantly in any location.

General Electric X-Ray know-how can save you headaches arising from either normal welding inspection problems or from defense contracts specifying x-ray examination. A half-century in x-ray, over 30 years of it industrial, and a complete line of apparatus up to 2,000,000 volts, plus a continent-wide factory service organization — these are your assurances of satisfaction when GE X-Ray tackles your inspection problems.

Avoid regrets — investigate non-destructive x-ray inspection NOW. Address General Electric X-Ray Corporation, Dept. AE-6, Milwaukee 14, Wisconsin.

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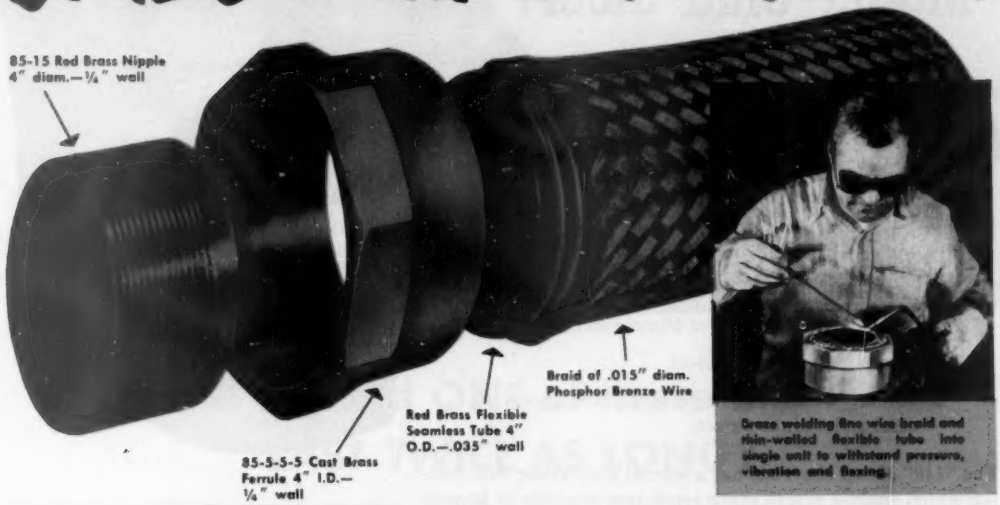
How to produce it profitably?

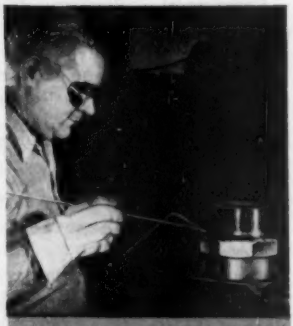
braze weld it-of course!



Braze welding fine wire braid and thin-walled flexible tube into single unit to withstand pressure, vibration and flexing.

This assembly must hold liquids, steam or gas under high pressures—while withstanding vibration and continuous flexing. Made up of dissimilar metals of widely varying thickness, it's braze welded on a production basis with ANACONDA 997 Low Fuming Bronze Rod.

ANACONDA Bronze Welding Rods can keep your welding costs down with fast, strong, uniform welds on even the most difficult production jobs. Our Technical Department will gladly help you with any bronze welding problem. ANACONDA Welding Rods are sold by distributors throughout the United States. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

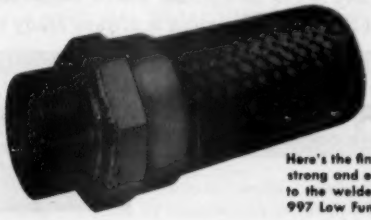


Now the red brass nipple and cast brass ferrule are joined together and to the first weld. This calls for pressure-tight joint between nipple and flexible tube and a strong joint to the ferrule...

For every braze weld, there's an

ANACONDA®

BRONZE WELDING ROD



Here's the finished job, neat, tight, strong and economical — a credit to the welder and to ANACONDA 997 Low Fuming Bronze Rod.

Welding Monel-Clad Steel?

"140"s are right!

If you are doing any of the following jobs, Inco's *"140" Monel* electrode is the one to use:

1. Welding the clad side of Monel-Clad Steel.
2. Overlaying Monel on steel.
3. Joining wrought or cast Monel and nickel to steel and stainless steel.

The *"140" Monel* electrode has a special low-carbon flux coating which enables you to make crack-free deposits of Monel® directly on steel.

For special applications, the *"140" Monel* electrode offers other important advantages:

- Eliminates the need for a seal bead of nickel in welding the clad side of Monel-Clad Steel.
- Eliminates need for a barrier layer of nickel weld metal between steel and Monel overlays.
- *"140"* welds have corrosion resistance and physical properties comparable to solid Monel.

Although not recommended specifically for that purpose, *"140" Monel* electrodes may be used to weld solid Monel in place of the standard *"130X" Monel* electrode.

Because of the heavy demands being made on our resources by the national rearmament program, you may not be able to get all the Inco welding materials you need. If you encounter problems in welding any of the Inco Nickel Alloys, remember that Inco's Technical Service Department is always ready to assist you.

Technical Data for
"140" MONEL ELECTRODES

Current requirements: **D.C., reversed polarity**

3/32" dia. — 35 - 60 amps.
1/8" dia. — 70 - 110 amps.
5/32" dia. — 110 - 150 amps.
3/16" dia. — 140 - 190 amps.

Properties of welds:

Joint	Tensile P.S.I.	% Elong.
Monel to mild steel	70,100	45
Nickel to mild steel	64,600	49
Monel to Type 316 stainless	87,800	44
Monel to Type 347 stainless	81,100	48

Guided bend test specimen of welded overlay made with new "140" Monel electrode directly on 3" by 6" by 3/8" steel plate. Note the excellent ductility and adherence of the deposit.

THE INTERNATIONAL NICKEL COMPANY, INC.
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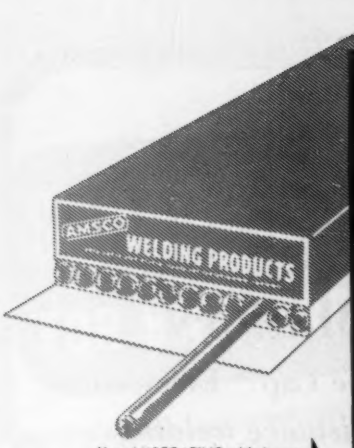
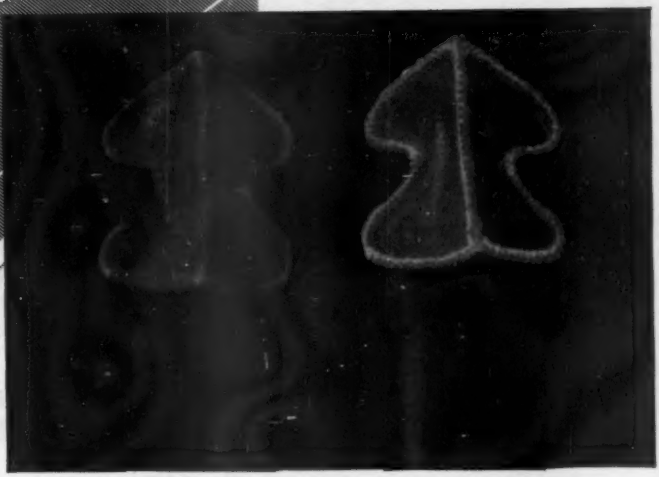


How AMSCOATING with Amsco Hardfacing Rods saves you materials . . . manpower . . . money.



Why will ONE of these bits LAST TWICE AS LONG?

AMSCOATING...stands for control of wear by Hardfacing...

Hardfacing rods—and recommendations for their use—are as sound as the manufacturer who makes them. AMSCO has been fighting wear for a half-century—first with Manganese Steel, and later with AMSCO Hardfacing Products.

If you have a problem of wear caused by impact, abrasion, heat or corrosion . . .

Find out how AMSCOATING can save you materials . . . manpower . . . money!

These bits are used by a Southern quarry for drilling blast holes. A combination of limestone and flint causes extreme abrasion—and a real problem of wear. In an attempt to cut replacement costs, labor and down-time, several makes of hardfacing rods were tried, but without much success.

Six years ago these bits were AMSCOATED with an Amsco® rod specially developed for combatting abrasion and impact.

Result? AMSCOATING did a job that had never been done before. The drill bits held their edges longer . . . averaged 60 hours of drilling—between regrinds—instead of 30. Maintenance costs and bit changes were cut in half!

AMSCOATING saves you money in terms of lower maintenance costs, less down-time . . . more production. *The actual on-the-job example cited above is one of the many applications that prove it!* Write today for illustrated catalog describing dollar-saving AMSCO rods . . . and the name of your nearest AMSCO distributor.

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THE RIGHT WAY TO SAY HARDFACING

Brake Shoe AMERICAN MANGANESE STEEL DIVISION

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Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

Value Beyond Expectation!

(cross-section of fluted water hole in shank)

Mallory

"Nu-Wrinkle Cap"* Electrodes

for resistance welding

Outstanding Features of Mallory "Nu-Wrinkle Cap" Electrodes

1. Smooth, annular corrugations of cap skirt provide positive electrical and thermal contact with shank.
2. Resilience of corrugations effects secure attachment of cap to shank.
3. Wiping action of corrugations cleans adjoining surfaces of shank, assures low electrical contact resistance.
4. Hollow cap skirt has the largest practicable cooling area, results in a maximum rate of heat transfer.
5. Smoothly rounded skirt corrugations minimize damage to shank, insure maximum shank life.
6. Unique design eliminates possibility of cap being forced askew into shank.
7. All standard Mallory nose shapes are available in Elkaloy A† or Mallory 3† metals—#1 or #2 Morse Taper shanks.
8. All shanks have fluted** water holes, increasing the effective cooling area by 70% compared with round holes.
9. Many existing welding dies can be easily bored or sleeved to utilize Mallory "Nu-Wrinkle Cap" Electrodes.

*Trade Mark, Patent Pending
**Patent Pending
†Reg. U. S. Pat. Off.

Reduce Electrode Costs... Conserve Copper Alloy

Mallory engineering laboratories are working continuously to increase welding efficiency by making practical and effective contributions to time saving and cost reduction. The latest result of this continuing research and development is the Mallory "Nu-Wrinkle Cap" Electrode.

Composed of a replaceable cap inserted into a reusable shank, the Mallory "Nu-Wrinkle Cap" Electrode reduces electrode costs and also conserves critical copper alloy. Extensive spot welding tests have shown that, in most applications, the performance of the Mallory "Nu-Wrinkle Cap" Electrode compares favorably with that of a conventional one-piece electrode.

When the face is no longer serviceable, it is necessary only to replace the cap. If good welding practices are observed, many Mallory "Nu-Wrinkle Cap" Electrodes can be used with the same shank. Since the cap is relatively small and inexpensive, it can be replaced at a fraction of the cost necessary to replace or remachine a complete electrode.

In addition, the Mallory "Nu-Wrinkle Cap" Electrode makes a readily replaceable insert for die applications.

That's value beyond expectation!

Mallory resistance welding know-how is at your disposal. What Mallory has done for others can be done for you!

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NON-SYNCHRONOUS COMBINATION UNIT . . . one enclosure houses an electronic contactor to make and break power circuit and a timer to govern weld duration and electrode motion.

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CONSISTENCY • Timing circuit coordinates firing relay operation to give consistent starting point and full cycles of welding current, thus avoiding high transients and transformer saturation.

LOW MAINTENANCE • Industrial construction cuts "down"-time, simplifies servicing. Disconnect plugs permit instant exchange of timer panels. Entire timer, including power supply, is removed in one piece without disturbing external connections. Two ¼ turn fasteners release swing-down panel making all components and circuit tie points instantly accessible at screw terminals.

Class 8992, Type ACG-1 for wall mounting

Class 8992, Type ACG-2 for side of machine mounting

Write for Bulletin 214, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

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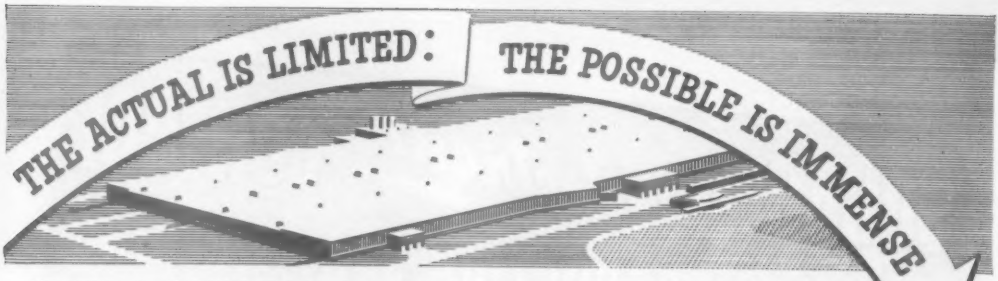

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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FLEXIBILITY IN MANUFACTURE MEANS LOWEST COST PER PIECE

Products designed to utilize the economies of welded steel can be manufactured at lower cost regardless of quantity produced. Any product design can be developed from an unlimited combination of steel shapes to suit the type of manufacturing equipment available.

Each of the tee sections shown has been designed to withstand equivalent loads. As quantities of production increase and brakes, shears and forming equipment become advisable, less material is, of course, required and the amount of welding itself can be reduced.

Your Lincoln Welding Engineer will gladly explain how your products can be simplified and fabricated at lower cost using welded steel construction. Simply write The Lincoln Electric Company, Cleveland 1, Ohio.

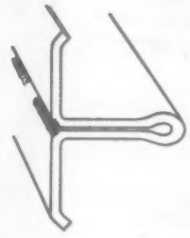

Fig. 5. For higher quantity production, tee can be brake formed as a single piece from sheet and automatically Lincolnwelded at top. Weighs 30% less than Figure 1 . . . costs 40% less.

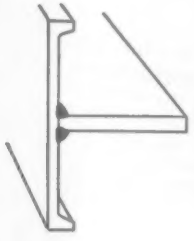

Fig. 4. Tee section fabricated from light channel is automatic Lincolnwelded to plate cut to shape by high speed equipment. Gives better material distribution. Costs 35% less than Fig. 1.

Fig. 3. Angles, brake formed from plate, have better dimensions to withstand loading. Section requires only light, intermittent welds. Costs 30% less than Figure 1.

the ACTUAL

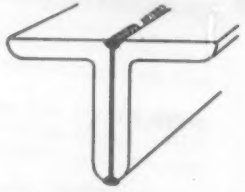

Fig. 1. Tee section fabricated in small lots by welding standard angles back to back. Requires only hack saw and welder.

increasing the YIELD

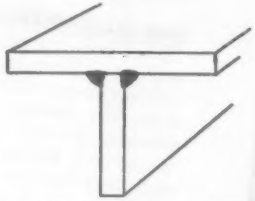

Fig. 2. Tee section for medium quantity lots for the shop having shear or flame cutting equipment. Costs 25% less than Figure 1.

the IMMENSITY of the POSSIBLE

Economical production regardless of quantity

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THE LINCOLN ELECTRIC COMPANY

CLEVELAND 1, OHIO

ESTABLISHED 1916 THE WELDING ENGINEER JUNE, 1951

Thinking Is Hard, but . . .

THE FIRING of General of the Army Douglas MacArthur will probably go down as one of history's turning points for this country.

The people as a whole were awakened to the low state to which we have allowed our government to sink. Perhaps, MacArthur's sacrifice of a great military career will not have been in vain.

When you start to discuss this MacArthur business with friends and acquaintances, you become aware that thinking is something that seems to come awfully hard for the average American. It's so much easier to take a ready-made opinion . . . and so many such opinions are being offered by newspaper columnists, radio commentators and self-assured politicians.

It would do little harm except for a rather curious phenomenon: those who would destroy our present way of living have been able to do much the better job of selling their ideas. Maybe it's the old, old story of following the Pied Piper to destruction.

The inability of so many Americans to do their own thinking has made them the ready prey of Communists and fellow travelers. Tell one of these gullible victims that he is not getting a fair break in our present form of democratic capitalism, and he will agree with you. Tell him it's a lot better to be under a Communist government, and he'll swallow it whole, without once taking the trouble to check up. Soon he is talking the Party Line with all the glibness of a parrot spouting oaths learned from a drunken sailor.

I note this in particular because some fellows employed in the welding industry have been sending me subversive literature anonymously. Do these misguided workers realize that the avowed aim of Communists is "to dominate a person's life from the cradle to the grave, in every detail"? Do they realize you can't strike in Russia . . . and live long enough to walk in a picket line? If you don't like working conditions, that's just too bad.

Wages are low, too. In terms of clothes, the Russian weldor has to work 22 days to get enough money to buy a suit; the American weldor can buy a much better one for 20½-hours' pay. The Russian has to weld for 32 hours to buy a cotton dress for his wife; the American weldor puts in four hours and buys his wife a far more stylish and attractive garment.

If the poor old Russian needs new shoes, he gets not very good ones for 108 hours' labor. The American buys an excellent pair of shoes for what he can earn in 6 hours. The Russian, if he could afford such a luxury as a bottle of beer, would toil 1 hour and 40 minutes for it; after working the same length of time, the American can buy 17 bottles of very drinkable beer. Do we want to bring Russian conditions over here?

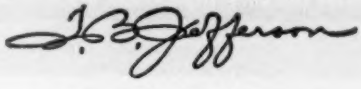
Once we start to do our thinking, based on facts and nothing else, we come to the conclusion that the United States, no matter what faults it may have, is the best place in the world in which to earn a living and enjoy what you earn. In no other country is opportunity so bountiful or goods so abundant. It takes thinking, however, to realize this.

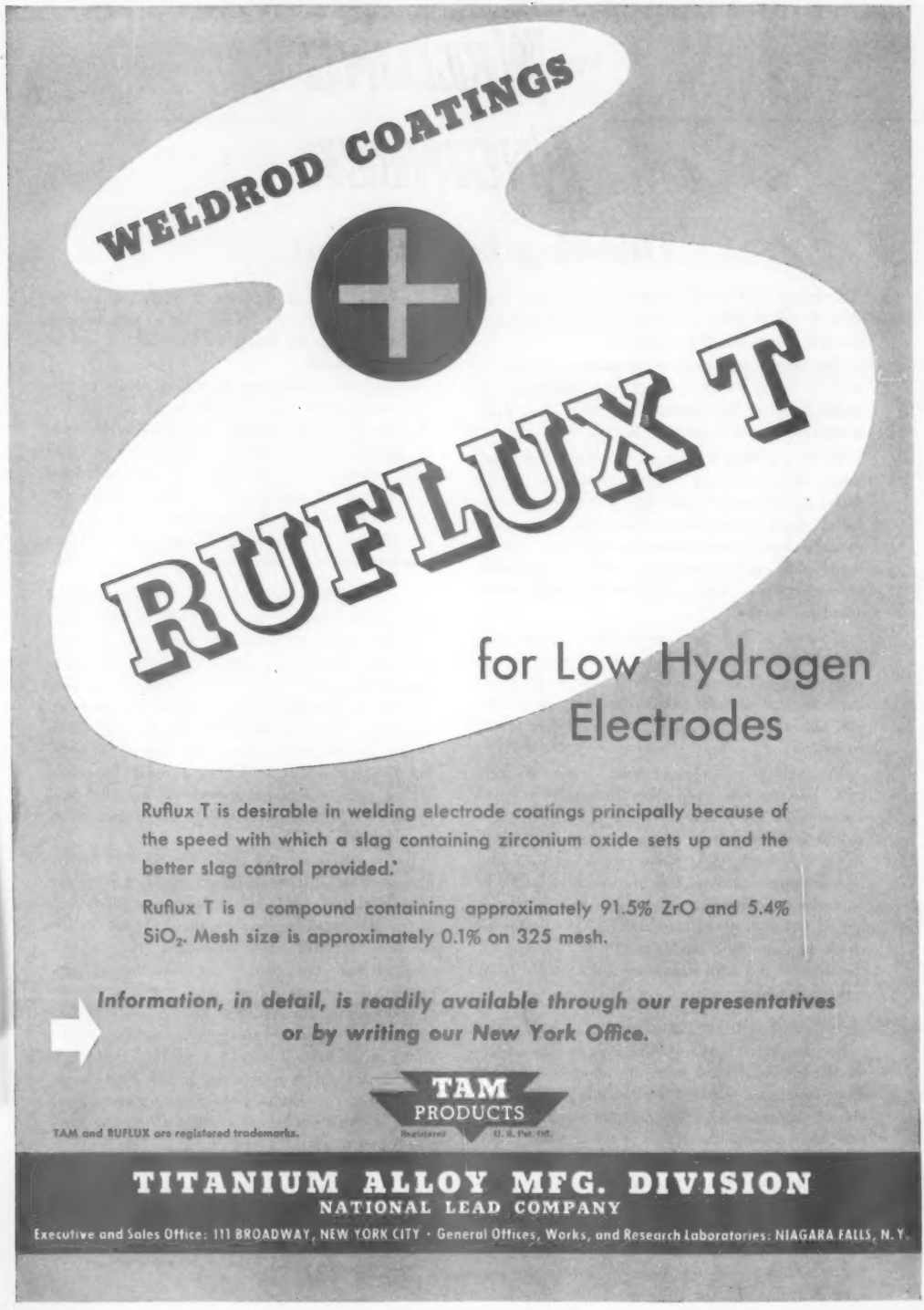
There's a lot of thinking to be done about welding, too. Maybe we can help to stimulate the thinking of engineers and designers so that they will break away from tradition and incorporate welding in their products.

One good reason for doing this is that the replacement of obsolete joining methods by the use of welding will result in a saving of at least 10% in the amount of material required. That's terrific in these days of metal shortages. If increased strength and other factors are taken into consideration, the savings will be much greater.

Very oddly, the greatest savings are possible where the greatest reluctance to use welding exists. That's in the field of structural welding. Not much original thinking is being done in this field except in Houston, Tex. Houston has a greater tonnage of buildings with welded steel frames than the combined total of all cities east of the Mississippi.

Structural engineers who want to do their own thinking might start by investigating what Houston architects and engineers have learned.

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FORT PECK power plant from downstream, showing tunnels 4, 3 and 2 (left to right). The surge tower (center) is the tallest building in Montana—250 feet. Dam's left abutment may be seen left of surge tank structure

More Welding at Fort Peck

Fabrication of a 65-ton riser tee to connect a penstock with the surge tower was a job for giants. Here are the details on the way the welding was done.

BY T. B. JEFFERSON

IN THE BARREN hills of northeastern Montana, on the upper Missouri River, will be found the largest earth-filled dam in the world. Welding was most important to the construction of Fort Peck, and Fort Peck has been equally important to welding.

Without welding and hard-facing to maintain the various dredges, draglines, tractors and other earth-moving equipment needed in building the big dam, it is doubtful if the United States Army Engineer Corps would have been able to complete the project in record time. Welding helped make it possible. On the reverse side of the coin, the widespread use of welding for equipment maintenance that occurred during World War II may have resulted, in part at least, from the experience gained at Fort Peck by U. S. Army engineers. Without the Fort Peck background, our army would have had to learn its lessons on equipment maintenance the hard way—under difficult wartime conditions.

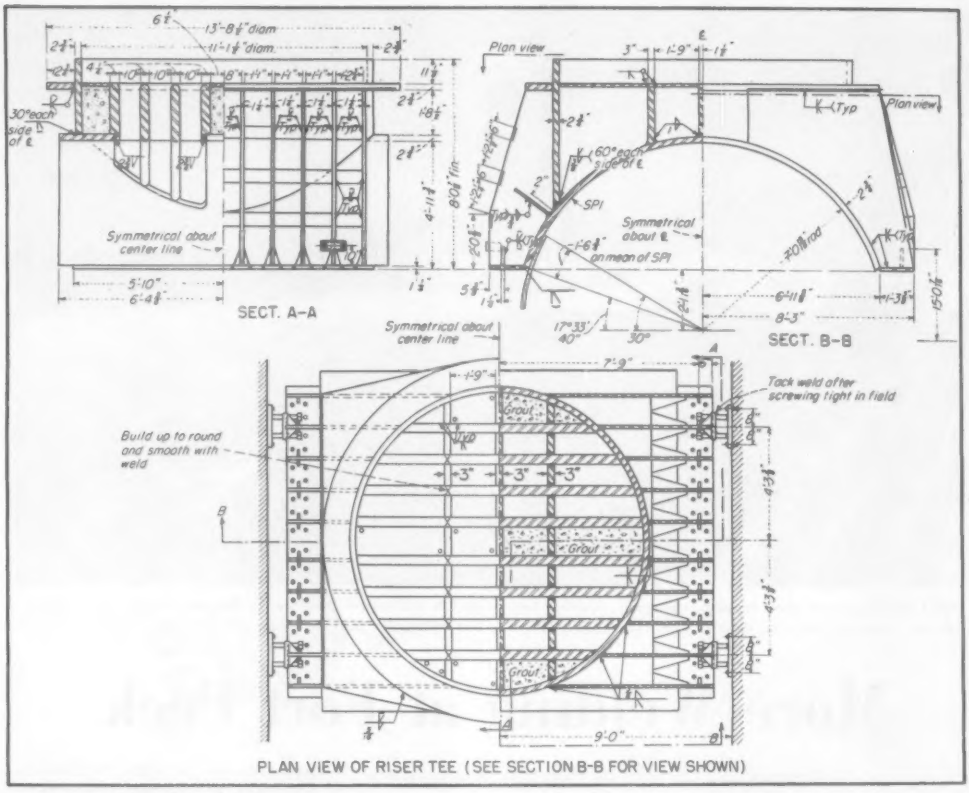
Welding is still playing an important role at Fort Peck. Today, welding is not only being used for maintenance but also for the fabrication of equipment installed in and for the huge Fort Peck power plant. The latest addition to the plant is its third generating unit.

In connection with this installation, it was necessary to build a 65-ton riser tee to be installed at the junction of the surge tower with the penstock. This mammoth tee forms the connection between the 14-ft penstock leading into the No. 3 generator turbine and the 11-ft diameter vertical surge tower. Purpose of the surge tank tower is to relieve the tremendous hammer surge that would otherwise be built up when the turbine valves are closed—likewise to control the back pressure that may be built up during the regulation of the turbine. The service to which this man-size pipe fitting was to be subjected called for construction that could really take it.

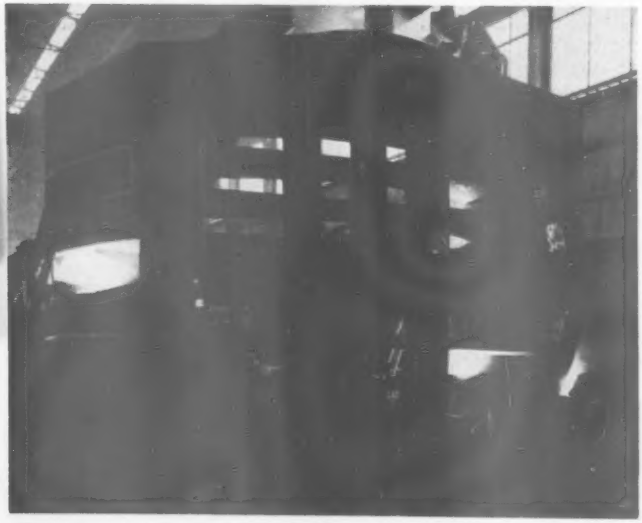
The riser tee was fabricated at the South San Francisco plant of the Consolidated Western Steel Corp., subsidiary of the U. S. Steel Corp. It is the heaviest of its kind ever fabricated by Consolidated Western. When finished, the big welded tee was shipped to the E. V. Lane Co., of Palo Alto, contractor for the penstock job.

The unique grid design, specified by U. S. Army engineers, called for a grid of welded steel plates. The horizontal grid plates (see section A-A of drawings on page 18) were 4¼ in. thick, the vertical grids 3 in.

The lightest materials used in the fabrication were the 1¼-in. plates that served as gussets. The majority of the plates were 2 in. and over. Plates over 2 in. were of ASTM


SECT. A-A
SECT. B-B
Plan view
Symmetrical about center line
Symmetrical about ℄
Tack weld after screwing tight in field
Build up to round and smooth with weld
Grout
PLAN VIEW OF RISER TEE (SEE SECTION B-B FOR VIEW SHOWN)

ENGINEER DRAWING of 65-ton Fort Peck riser tee. Sections A-A and B-B show plate thicknesses and welding details



GRID for the big riser was made by welding 4¼-in. to 3-in. plates. To avoid distortion, weldors worked in pairs, on opposite sides of weldment

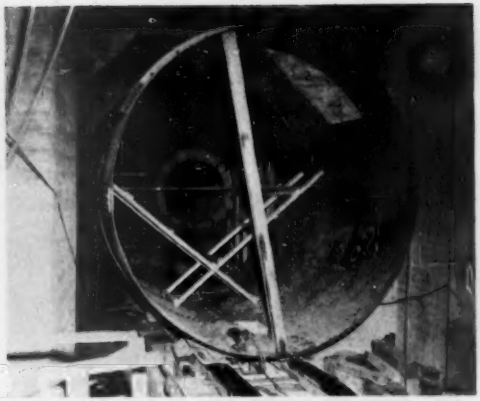
A-201 grade A firebox-quality steel, and plates less than 2 in. were ASTM A-285 grade C flange-quality steel. In general, the plates for the penstock saddle and its vertical connection (which forms the grid shell) were all 2¾ in. thick.

How Edges Were Prepared

Plate preparation was naturally one of the first problems to present itself. To insure full penetration, all grooves for the grid members were of the double-J type; this groove had a ⅛-in. land and a ⅜-in. bottom radius. The groove openings for the 3-in. vertical grid plates were all 1⅛ in. Because of the curvature of the shell, the openings for the 4¼-in. horizontal grid plates had to be individually developed to provide the proper working clearance.

To minimize stresses and shrinking, an extremely tricky welding procedure was followed. More of this

RISER TEE on skidway ready to be moved to final position. Grid is at top to connect with the surge tank



SECTION of 14-ft penstock for third hydro turbine has been cut out at top for riser tee (in background)

later on. Welding was continuous, on a three-shift basis, and was stopped only when the weldment was placed in the stress-relieving furnace during week ends.

During the course of the welding, the grid section was stress relieved three times. Moreover, the weldment was never subjected to any abrupt cooling (since welding was continuous) and this likewise minimized shrinkage cracks. Preheat was not necessary; once welding was started, local areas of the grid section became hot enough to provide their own preheat.

Weld from Center Outward

All of the welding was performed by certified hand weldors with the exception of the longitudinal seam of the penstock saddle plate. This seam was automatically welded by submerged-arc. The success of the entire operation must be attributed to careful planning, particularly with regard to the procedure sequence.

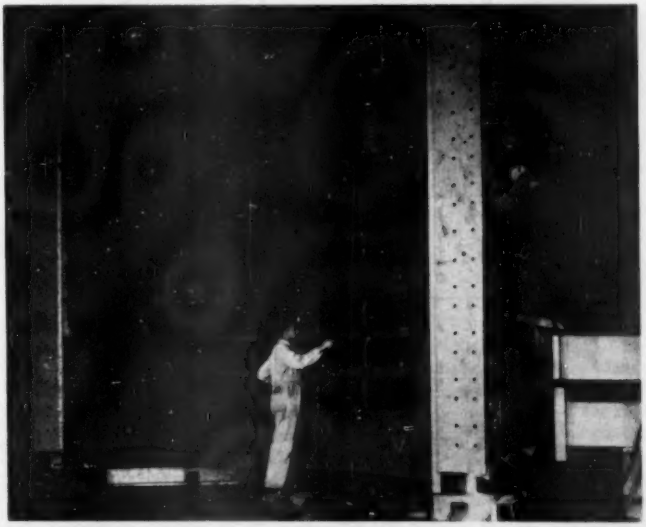
In general, welding proceeded from the center of the grid outward; hand weldors worked on opposite sides of the same seam from the center outwards. All welds were deposited in approximately 1/3 steps, and wherever possible the deposits were peened between weld passes.

To begin with, both the grid and the outside shell members were tacked with E-6010 electrodes. Then the root passes and all subsequent passes on the J-groove on the grid and shell skirt seams were made, using E-6016 low-hydrogen electrodes. The root passes of all the heavy welds were either back chipped, or a high enough current was used to insure full weld penetration.

All welding was done with d-c welders using reverse polarity. Some arc blow was experienced. Had sufficient a-c equipment been at hand, it would have undoubtedly been used to avoid the conditions brought about by arc blow. These, however, were not serious and did not handicap the welding. The weldment was positioned so that a majority of all the welds could be made downhand. Weld defects were repaired by flame-gouging to clean metal before rewelding.

Upon completion of the grid weldment, it was fitted up and welded to the penstock section to make the tee. The circumference and diameter were continually checked for distortions due to welding on both the grid and penstock weldments. Little was found. The approximately equal weld deposits emanating outward from the grid weldment kept distortion to a minimum. Upon completion of the welding, no trouble was experienced

(Continued on page 31)



FASTENED on a low-bed freight car, riser is given a final inspection by Consolidated's E. H. Cole before it's shipped to the general contractor

25-TON ALL-WELDED Bessemer converter "blows her top" during the refining stage of steel manufacture

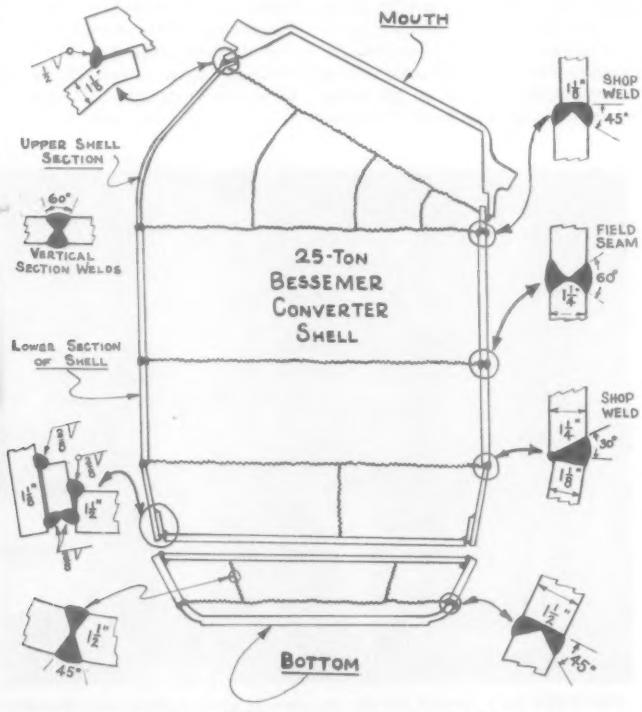
THREE ACTIVE converters as seen from the side. A fourth active converter will be added at a later date

First All-Welded

Four 25-ton converters were fabricated for the National Tube Co. Lighter, cleaner and more streamlined equipment resulted by changing to welded construction.

BY H. L. McFEATERS

Chief Engineer, Pennsylvania Engineering Corp., New Castle, Pa.



DRAWING of converter shell was made to show details of the various welds

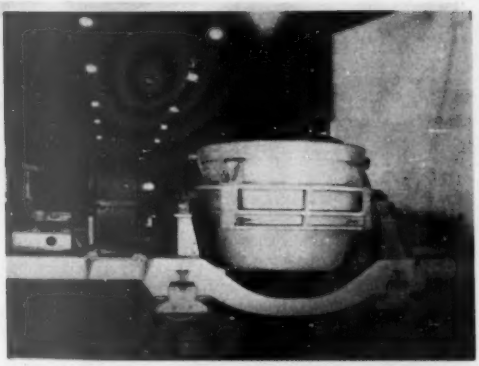
MAKING STEEL by the Bessemer process is a spectacular business. The converter resembles a giant flame-thrower in action, belching forth smoke and flames up to 30 ft in height.

The converter does exactly what its name suggests. It converts or refines pig iron to steel by blowing air through white-hot molten iron to oxidize or burn off impurities. It is a large pear-shaped steel vessel, open at the top and mounted on trunnions for pouring.

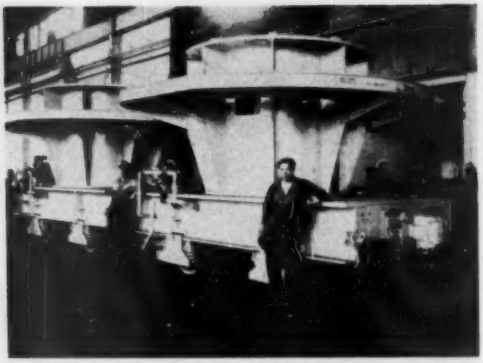
Converters are usually riveted. Here we are glad to tell you about the first all-welded converters. Four such vessels were installed recently at the National Tube Co's Lorain, O., plant. Each is capable of producing 25 tons of refined steel in less than 20 minutes. Three of these converters are active, but the fourth is used as a relining converter; provision has been made, however, for installation of the fourth active converter. The present four converters were fabricated by the Pennsylvania Engineering Corp.

Steel-Making Operation

Molten pig iron from the blast furnace is poured into the mouth of



HOT-METAL transfer car, also welded, will carry 35 tons of pig iron from the mixer to the converters



JACK CARS are used when a new bottom is to be installed. The jack car rams the new bottom into place

Bessemer Converters

the refractory-lined converter. Air is admitted to the blast box at the bottom and is blown through the fiery metal at about 25 to 30 psi. The impurities are thus burned and blown out of the glowing metal. Alloy additions are then made to bring the steel to the desired composition.

A converter consists, essentially, of a shell, supporting structure and trunnion ring. The trunnion tilting drive is mounted on a base plate of welded steel and rotates the converter at 1 rpm. The changeover to welded construction has resulted in lighter, more streamlined and cleaner converters. Projecting surfaces where splashed metal could be entrapped have been eliminated.

Serving the new converters are hot-metal mixers, hot-metal transfer cars, scrap cars and a jack car. The streamlined cars are, for the most part, of welded plate and slab construction. As an example of "before and after," the jack car was previously built of cast frames, and the table for supporting the bottom was a combination of cast and structural sections. Now these units are completely built up of welded plate, except for the cylinder and plunger. The jack car is used when a new bottom is to be installed on the converter.

There are two 800-ton welded mixers where batches of hot metal from the blast furnaces are intermixed for uniformity and held until needed at the converters. These mixers hold from 150 to 1,300 tons of molten pig iron, brought to the converters in hot-metal transfer cars. Scrap transfer cars bring steel scrap to the converters; scrap is often added during refining to help control the reaction.

Welding Details

Because of the shape of the equipment, it was impracticable to use an automatic process. All of the welds were made by the manual metal-arc process, and all were multiple-pass welds. The accompanying drawing of a converter shell shows details of weld construction. The heavy plates were vee-grooved and welded with 3/16-in. electrodes for the root pass and ¼-in. electrodes for the balance of the passes. Whenever possible, welding was downhand; weaving was done only for vertical welds and where positioning was difficult for down welds. Continuous ½-in. fillet welds were used for the heavy supporting stand (made of 2-in. and 3-in. plates) and for the support of the drive base plate.

Part of the welds on the 1-in. supporting base plate were continuous ⅜-in. welds, and the rest were intermittent ⅜-in. welds at 12-in. centers. For the ⅜-in. guard plate over the machinery, continuous 5/16-in. welds were used.

So large were the converter and mixer shells that they had to be knocked down for shipping. Suitable strap plates were supplied for assembly. These were removed after welding, and the holes plugged and welded flat.

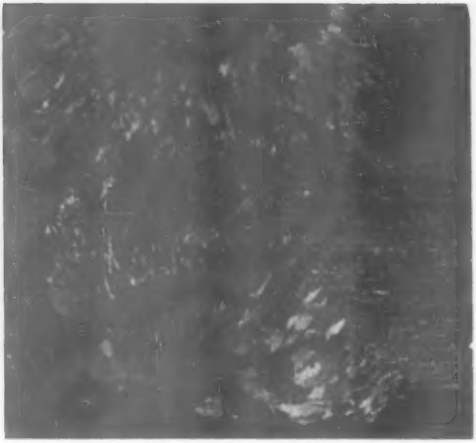
The trunnion ring supporting the shell was shipped in one piece in a depressed-bottom car.

The largest single-leg gantry crane in the world was recently installed at National Tube's Lorain Works to service the Bessemer converters. This all-welded 125-ton crane, featuring hermetically sealed box sections in its girders and legs, was built by the Cleveland Crane & Engineering Co., Wickliffe, O.

Today the big tonnage of finished steel in the United States comes from open-hearth furnaces. As an example, about 65 million tons were produced during the first nine months of 1950 as compared to Bessemer steel production of 3½ million tons of finished steel for the same period.

In view of frantic demands for additional steel-making facilities, the Bessemer process can be very helpful. Besides regular production of Bessemer steel, the converters are able to supply rapidly large amounts of partially refined hot metal for "duplexing" or finishing in open-hearth furnaces. Undoubtedly new converters will be needed in the near future, and undoubtedly they will be fabricated by welding.

3—POOR WELD at 3½ X. Note the lack of bond in the ⅛-in. nose area. This weld was one not back chipped



4—BACK CHIPPING produced an excellent weld as this picture shows. Porosity was held to the minimum

Bus Bars of Aluminum

Kaiser's big aluminum reduction plant at Mead, near Spokane, Washington, the third largest in the world, turned on the juice in its seventh potline in February, 1951, adding 40,000,000 pounds of primary aluminum to the plant's annual capacity.

The 140 electrolytic pots which make up the new line were purchased in 1950 from the idle government-owned plant at Riverbank, Calif.

Included in the expansion program was construction of two 740-foot-long potroom buildings to house the new pots and additions to the electrical rectifier station, the carbon batching and baking plant and other facilities.

Instead of being made of copper, the bus bars were of aluminum. More than 600,000 lb of high-purity aluminum, manufactured at Mead, were used in the construction of the bus bars in the new potline. These aluminum bars were rolled to size and gage at Kaiser's 53-acre rolling mill at Trentwood, 12 miles east of Spokane.

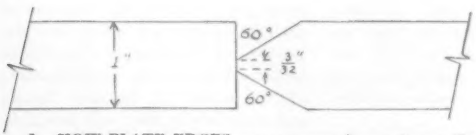
Instead of bolting, these aluminum bus bars were joined by welding. In the following article, F. W. Douville, electrical engineer at Mead, tells why and how they were made.—*The Editors.*

BY F. W. DOUVILLE

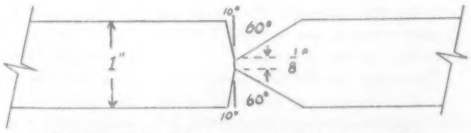
COPPER IS conventional for bus construction for aluminum reduction cells. The generally accepted method has been to use copper bus bars, usually ¾ by 10 in. or ⅝ by 10 in., with a bolted lap joint type of construction. The current density in a bus bar of this type, assuming 50,000 amperes as the total current, is 925 amp per square inch.

Solid silver bus bars were used during World War II when copper was very hard to get. The silver bus was ⅝ in. thick by 8 in. wide. The conductivity of silver is only 8.4% greater than copper. However, the current density of the bus was 1,250 amp per sq in.—an increase of 35% over the density in copper.

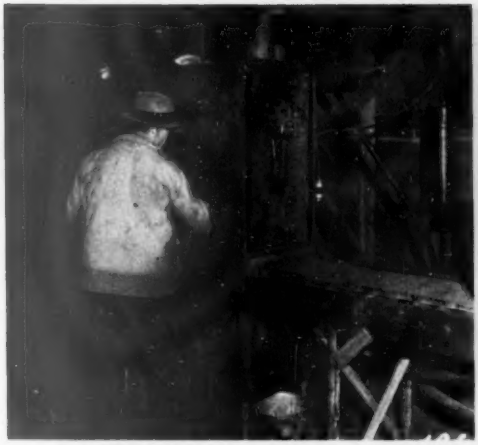
From these figures, it appears that the current density in the silver bus would be too great. However, the installation of the silver was a temporary measure and the power loss in the bus was of secondary impor-



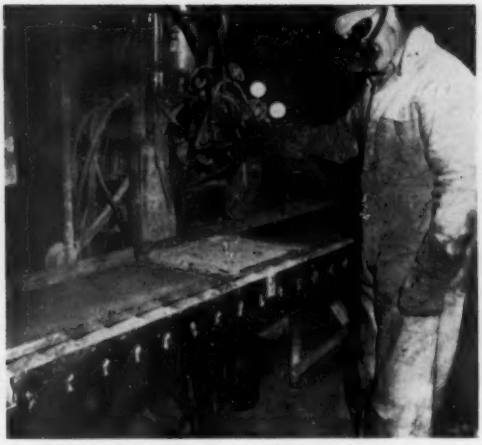
1—HOW PLATE EDGES were prepared experimentally



2—EDGE PREPARATION, actual welding conditions



5—SANDBLASTING equipment was set up in the production line to prepare the aluminum for metallizing



6—METALLIZING avoided welding copper to aluminum. They sprayed the aluminum with vaporized copper

Saved Kaiser 70%

tance, whereas the cross-sectional area of the copper had been carefully selected to give the most economical operation over a long period of time.

If silver can be substituted for bus bars, then why not aluminum? True, the conductivity of aluminum is about 39% less than that of copper, but the lower conductivity can be compensated for by increasing the cross-sectional area wherever space permits.

Savings from Aluminum

Aluminum offers savings in both weight and costs. Let us look at these.

Per unit of volume, copper weighs three times as much as aluminum. Two thirds of the weight of copper, therefore, will be saved by using aluminum, or, rather, would be saved if aluminum and copper had the same conductivity. Since the volume of aluminum that will be equal in electrical resistance to the resistance of the copper is greater by 39%, the 66.67% weight saving must be corrected.

For equal resistance, 1.39 cu in. of aluminum equals 1 cu in. of copper. Converting these volumes to units of weight, 0.136 lb of aluminum equals 0.323 lb of copper. The difference in weight is 0.187 lb or 58% of the weight of the copper. This 58% is the corrected percentage of weight that will be saved by the substitution.

The market price at the present writing is 17c per lb for aluminum and 24c per lb for copper. The cost of the 0.323 lb of copper is, therefore, 7.75c and the cost for the weight of aluminum that has the same conductivity, namely 0.136 lb, is 2.3c. The saving is 5.45c or 70% of the cost of the copper. The fabrication costs of aluminum will represent an additional saving because the lighter-weight material lessens the handling problem.

Bolted Joints, Greater Resistance

The bolted lap joint type of construction has always presented a problem since it inherently introduces an additional resistance in the line. With the very high currents involved, the power loss in the joint becomes appreciable. By using this type of construction with aluminum, the problem becomes even greater. The aluminum is soft enough to actually cold flow under the extremely high pressures exerted on the area, and it becomes difficult to keep the joint tight. The extra material used in making a lap increases the amount of material required by 10%.

After we had reviewed the above advantages and disadvantages, we decided to investigate the possibility of using a welded type of construction in order to eliminate the lap joint. We also had to investigate the problem of welding aluminum. Since we had had no experience along this line, we contacted everyone that might be of help including our research department at Trentwood, Wash., The Linde Air Products Co. and the division of industrial research at Washington State College. Upon the recommendations of these authorities, we purchased an argon-shielded metal-arc welding machine and began experimental work immediately.

This machine is used with a d-c welder of at least 400-amp capacity. The welding wire is automatically fed through a water-cooled gun. The arc between the wire and parent metal is shielded by an argon gas envelope. The wire is fed through a tube from the machine to the gun and is driven by a knurled pressure roller. The drive mechanism is powered by a d-c motor, and the wire speed can be controlled manually. A voltage relay is used to start and stop the feed. With an open-circuit voltage of 85 volts, the relay is energized and the contacts that energize the feed motor are open. As soon as the arc is struck, the voltage collapses to 28 volts, the voltage relay is de-energized, and the

7—BENDING equipment was set up in the production line as was a punch press and other machines not shown

8—JIGGING for welding. All welding was done in the downhand position in order to speed up production

contacts close to energize the feed motor.

Questions We Had to Answer

Although the bus had not been designed at this time, some preliminary work had been done, and it was quite certain that the bus would be made from 1 by 12 in. aluminum. The type of joint would be a butt joint.

Our experimental work was set up primarily to find a solution to the following problems:

1. What size of welding wire should be used?
2. What heat or current setting would insure proper operation, sufficient penetration and a minimum amount of porosity?
3. What preparation should be made on the bus bars?
4. What degree of penetration could be attained?
5. What electrical conductivity could be expected in the weld area?
6. What would be the mechanical strength of the joint?

Two sizes of wire were available for operation in this machine—1/16 in. and 3/32 in. Several joints were made using both sizes of wire, and we decided that a better weld could be made with the 3/32-in. wire on material as heavy as 1 in.

A trial-and-error method was employed to determine the proper heat to use. We discovered that with currents under 300 amp the penetration was very poor and porosity was excessive. But 350 amp proved to be too high, as it was difficult to keep from burning through. Further experimental work on this problem was done just prior to fabrication.

We discovered that from 325 to 330 amp gave us the best all-around results. A current lower than 325 amp gave unsatisfactory penetration and excessive porosity. This increased porosity may be explained by the fact that the pool did not stay in the liquid state long enough to allow the gas inclusions to escape. With the higher heat, the pool was of sufficient size and depth to remain in the liquid state a fraction of a second longer—all that was necessary to allow the gas to escape. An optimum setting had to be decided upon since, as previously mentioned, too high a heat caused a burn-through. Actually, under fabricating conditions, the current setting found best for the job was 330 amp.

Edge Preparation

The next step was the determination of the proper edge preparation. We found that the weld area needed only enough space to allow the tip of the welding gun to reach it. This could be done by using an angle of 60 deg with a flat nose 3/32 in. wide, as indicated in Fig. 1. Under actual welding conditions the preparation was altered slightly, as indicated by Fig. 2. Note that in Fig. 2 both plates were beveled.

The penetration under the above mentioned conditions, proved to be only fair. Since a cold lap existed from the original root pass, we decided that back chipping was absolutely essential to insure complete bonding throughout the entire weld.

A cross section of a weld at 3½ diameters is shown in Fig. 3. The filler material on one side is not bonded to the filler material on the opposite side, and there is no bond whatsoever in the ⅛-in. nose area between parent metal and parent metal. This is one of the first experimental welds and was not back chipped.

As a contrast, Fig. 4 shows an excellent weld that was back chipped. Of course, proper current and technique were employed. You will notice the complete penetration and bonding—also the minimum amount of porosity.

Measuring Weld Resistance

Naturally it was very important for us to know how the welds were going to affect the conductivity of the metal. This could be learned by measuring the electrical resistance of the weld and comparing it with unwelded metal. To obtain a fair basis of comparison, we made a weld 12 in. long and cut it up into six test specimens. We then measured the resistance of each specimen across the weld area and across an equal length of parent metal. The resistances involved were of the order of 1×10^{-6} ohms.

In five of the six cases, the resistance of the weld area showed a decrease from the resistance of the parent metal. The five percentages of decrease were: 24.3%, 20.05%, 13.38%, 11.59% and 10.57%. In the one case where resistance in the weld area was greater than the resistance of the

9—WELDING was with inert-arc metal-arc equipment, using 3/32-in. aluminum wire and a current of 330 amp

10—PORTABLE RIG that was used to weld feeder bus in the field. A total of 320 field welds were made

parent metal, the percentage of increase was only 1.17%.

The average per cent *decrease* in resistance through the total length of the weld was 13.12%.

We also tested the tensile strength of the welded joint and found it to be slightly more than the parent metal per unit area. As there was no reason for removing the bead from the completed joint, the tensile strength of the weld was appreciably greater than the strength of the parent metal.

The information obtained from our experimental work greatly aided us in setting up the proper control to insure welds of high quality. We required a sample weld from each worker. This sample was sectionalized, polished, etched and carefully scrutinized for porosity and penetration.

The success of our experimental work, the 70% saving in material cost and the ease of fabrication were the factors leading us to make the decision to use aluminum for our seventh potline bus and to use welded construction. The actual design of the bus was the next step.

Since the reduction cell shells, mounting cradles, etc., were already at hand, we had to design the bus to conform to these physical dimensions. Provisions had to be made for shunting out a pot. The switch plates were to be made from 2-in. aluminum 12-in. wide and were much shorter than the conventional switch plates previously used. The copper "S" risers had to be reshaped to conform to the new bus. Past experience indicated that a copper-to-aluminum joint was not satisfactory, so we specified that all copper-to-aluminum joints were to be metallized. The aluminum joint area was to be sandblasted and sprayed with vaporized copper.

When the design was complete, Kaiser Engineers, Inc. set up a production line for fabrication of the bus. The major equipment consisted of a punch press, sandblaster, metallizer, bending machine, cut-off saw, welding machines, roll conveyor tables and two overhead monorail air-driven hoists.

All cutting, bending, milling, punching and welding was done with the aid of jigs. All welding was done in the downhand position. Figures 5, 6, 7, 8 and 9 show the assembly line.

Welding Feeder Bus

The feeder bus from the rectifier station was to be 24 bars of ⅝ by 10 in. aluminum. This bus had to be welded in the field, which required a portable welding rig (Fig. 10). The bus was welded and assembled on the ground and hoisted into position in one piece. The assembled piece was 170 feet long and had to be raised 30 feet. Due to the nature of the connection between this bus and the ring bus, it was impossible to eliminate all lap joints. Wherever a lap joint was made, a special corrosion-preventative grease was applied. The area was then wire brushed before the weld was made.

There were a total of 2,864 welds on the potline bus and 320 welds on the feeder bus. The average cost per weld on the potline bus, including handling time, chipping time, weld preparation time, assembling on jigs and rod pouring time was:

Labor	$ 9.20
Argon	2.00
Wire	1.70
Total	$12.90

About 25% of the total time was actual "rod pouring" time. The above figures represent the average cost calculated over the entire fabrication period. Toward the end of the job, the cost per weld was reduced to $7.63. All work on the potline bus was done during the 8-hour day shift with the exception of the welding. In order to keep a continuous flow of material to the assembly line, it was necessary to weld during two 10-hour shifts per day. This called for a premium rate of pay. Had no overtime been paid, the cost per weld could have been further reduced to $5.53 per weld.

Argon consumed for the entire job totaled 11,200 cubic feet. The total amount of welding wire was 3,900 lb. Both of these figures include the ⅝ by 10 in. welds on the feeder bus. The amount of copper metallizing wire consumed was 1,800 lb.

The conclusions that may be drawn from this project are very optimistic. The fabricating cost is quite reasonable, and it is felt that with more and more experience the costs could be further trimmed. The savings realized on the original cost of aluminum versus copper cannot be overstressed. In spite of the larger volume of bus required, the overall savings can safely be set at 70%.

1—SUBMERGED-ARC operates at a high speed and requires only one pass

2—SIDE SHEETS are welded together on three long parallel jigs, one of which is shown. Note window openings were previously flame-cut

Canada's Welded

Benefits of welding for the Canadian National Railways are a stronger, lighter passenger car. The pictures show how easily it's produced by modern methods.

BY HUGH G. JARMAN

CANADA'S RAILROADS are among the country's largest users of welding equipment. The lead in this respect is probably taken by Canadian National Railways, which uses over 427 welding machines and employs 735 full time weldors.

Canadian National has eliminated riveting on all of its work with the exception of locomotive boilers and some safety appliances. These the Railway Code still prevents from being welded, as it did many long years ago when welding was new and comparatively untried.

Proved by Test

The Code, however, doesn't object to 100% welded steel passenger cars, and Canadian National Railways was the first railroad to build them. These new welded steel coaches have proved themselves in all sorts of tests.

One test (unscheduled) was a full-fledged railway wreck. The welded coaches fared better than did the old-style riveted steel cars.

Some time ago the railway instructed its engineering department to design a 100% welded steel car for three different types of service: *(a)* baggage and express cars, *(b)* roomette cars, *(c)* air-conditioned day coaches. The finished cars are now being assigned to crack international and continental trains.

The actual production of the cars worked out as designed but for one small exception: it was necessary to put a few holding rivets in the deep rounded dome of the roof before the roof-welding jig could be placed in operation.

Uses Submerged-Arc

The sides, ends and all of the roof interior are of welded construction. For this high-production welding job, the railway uses the submerged-arc method (Fig. 1). Submerged-arc, as set up in the Canadian National shops, can go up to 60 ipm. Only one pass is required, which means the weldor does not have to go over and over the joint to add more metal and smooth it out. Parenthetically, the railway is at present changing over a considerable number of locomotives from coal to oil firing and is welding all of the fuel oil tank tenders by submerged-arc. Let's go back to the passenger cars, however.

Welding Car Sides

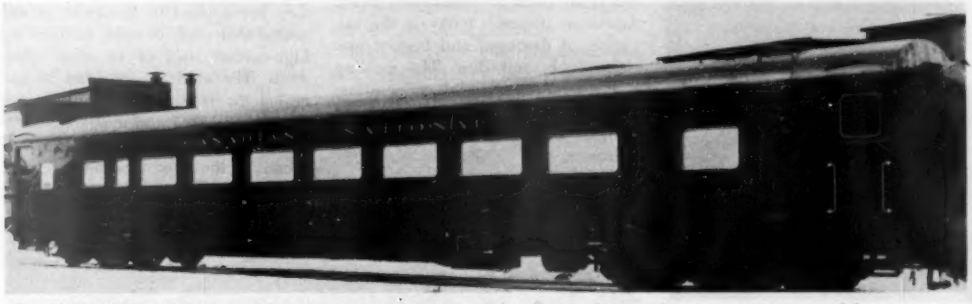
The welding jigs are located in the same bay as the erection track to eliminate double handling of the car sides, roof and ends after welding. There are three long parallel jigs for the side sheets (Fig. 2), which were previously flame-cut to size and cut out for window openings. The seams are submerged-arc welded to a 90% minimum penetration from the inside. To insure flat sheets, tension is applied by remote controlled electric hoists, which also position the sheets accurately.

The framing for the sides is assembled and welded in another jig at another part of the shop. This jig is arranged so that it is a simple matter to use it for either right-hand or left-

3—ROOF JIG is mounted on dolly and travels the length of the roof for making transverse welds in roof sheets. Roof is of deep dome type

4—LOOKING FORWARD in car. Interior details are fairly well along

Passenger Cars



5—COMPLETED CARS go into service on crack continental trains as day coaches, roomette cars and baggage cars

hand assemblies. All that has to be done is to set clips on positions painted yellow for one hand and red for the opposite hand.

After the outer sheets have been welded, the side is transferred to a center jig. Framing is set on top, and the two sides are welded to the framing. For this operation, the railway uses a 1,000-amp d-c welder.

Traveling Jig for Roof

Let's now have a look at the ingenious jig made to provide for the deep dome shape of the roof (Fig. 3). The roof jig is mounted on a dolly, which travels the length of the roof and allows access to all areas for welding. To allow the welded roof to be lifted without distorting, a full-length boom is fastened to it at several points by saddles.

On the interior of the car (Fig. 4), aluminum, stainless steel, Monel or Inconel are used. The railway finds that these various metals and alloys can all be welded by the inert-arc process.

Both interior and exterior surfaces of the completed cars (Fig. 5) are as smooth as glass from end to end, without the overlapping found in riveted cars. Besides the saving in weight (which the railway does not wish to divulge), the cars may be cleaned much faster because of their smooth surfaces.

One of Canada's two leading railways, Canadian National operates 22,692 miles of track stretching from Nova Scotia and Newfoundland on the Atlantic Ocean to Vancouver and Prince Rupert on the Pacific. Its subsidiary the Grand Trunk Railway System operates 974 miles in the United States.

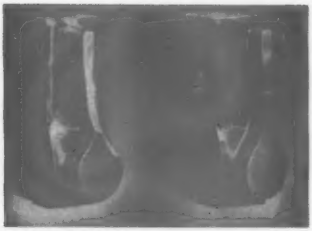
This important Canadian railway has long been a believer in welding for just about everything that it is possible for a railway to weld.

Die Welding by

In this two-part article, Mr. Butler gives you everything but the skill necessary to weld tools and dies. First installment discusses factors influencing hardness.

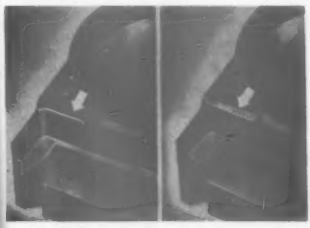
BY ARTHUR R. BUTLER

President, Welding Equipment and Supply Co., Detroit

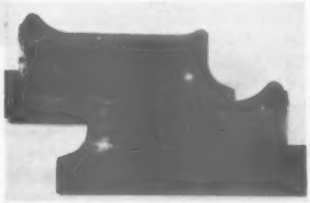


REPAIR: units failing in operation can be welded, either partially or wholly. Welded repair results in a minimum of down-time

COMPOSITE FABRICATION: use a mild, medium, high-carbon or low-alloy steel as a base and weld it with tool-steel electrodes that have the characteristics desired for cutting edges or working areas



CHANGES can be made in contours, corners or edges of tools and dies to correct a design during periods of die try-outs or die changeover



MACHINING ERRORS made in manufacture of tools and dies can be rectified. Welding in some cases replaces conventional inserting

VIRTUALLY all types of tool steel can be welded by the metal-arc method. Die units used for blanking, forming, forging, drawing, embossing, coining, hot and cold trimming, etc., can be salvaged or reclaimed.

Tool and die welding can be separated into four distinct phases (illustrated at left):

1. Repairing of dies.
2. Composite fabrication of dies.
3. Correcting of designs.
4. Rectifying of errors.

Dies are used most extensively in producing durable goods. The tool engineering profession realizes that one of the great problems confronting American industry today is the salvaging of damaged and broken precision tools and dies. The welding profession, in splendid coöperation, has developed tool and die welding methods having great economic significance.

Contrast to Hard-Facing

Generally, tool and die welding electrodes differ widely from the commonly known hard-facing welding rods and electrodes in composition and physical or mechanical properties. There is some overlapping in a few applications. Hard-facing materials were primarily developed to produce high hardness in combination with extreme resistance to abrasion. They are highly alloyed and contain varying amounts of such elements as carbon, chromium, tungsten, molybdenum, cobalt, nickel, etc. The iron content of these products is usually much lower than the combined amount of alloys present. Weld deposits made with hard-facing materials will not, as a rule, respond to heat treatment because of the high alloy content, which results in unchanging and unvarying hardness. Their coefficients of expansion and contraction are also very low. Contrastingly, tool and die welding electrodes differ widely in composition and physical or mechanical properties.

Tool and die welding electrodes can be divided into three distinct categories. In the first group are the basic tool-steel welding electrodes: water-hardening, oil-hardening, air-hardening, hot-working and high-speed steel. Preferably, these coated electrodes are minerally alloyed with various elements and are ferrous in character. They are in an annealed state, and the weld metal is hardened by air quenching from the high heat of the arc, approximately 6,200 F. The weld deposits are "hard-as-welded" whether they are applied to hardened or annealed tool steel, to mild, medium or high-carbon steel or to other alloy steels. The weld deposits can be annealed to facilitate machining and then heat treated and tempered. As a general rule, weld deposits will respond to the heat treatment recommended for the average tool steel in its classification.

The second group of tool and die welding electrodes is classified as alloy welding electrodes. Included in this group are low-alloy electrodes for plastic or zinc casting molds and flame-hardened dies. More highly alloyed electrodes used to weld dies for forging, drawing and forming are also in this group. They produce machinable weld deposits, not affected by heat treatment. Additional hardness is attained by work hardening. These electrodes are available in several different types, providing various hardnesses of weld deposits.

The third group is that of the other alloy electrodes that are sometimes used in conjunction with tool and die welding electrodes, especially for application on cast dies for drawing or forming. Nickel-iron electrodes, nickel electrodes and copper-nickel electrodes can be used as a foundation

the Metal Arc—I

on cast units preparatory to finishing with other tool and die electrodes.

Generally, tool and die welding electrodes operate equally as well with a-c or d-c. Their use, however, should be limited as much as possible to d-c, for which they were specifically designed. Mineral-alloyed coatings are desirable as they insure the incorporation of the required alloys in the weld deposits. The percentage of alloying elements lost during welding is compensated for by incorporating them within the coating itself.

The introduction of a mineral-alloyed coating on the electrodes is also conducive to a desirable spray action of the arc and forms a protective slag, easily removed.

Sound homogeneous weld deposits free from porosity can be secured with tool and die welding electrodes. Laboratory tests have revealed weld deposit structures that are superior, in many cases, to parent steel of the same class.

Factors Influencing Hardness

The hardness developed in weld deposits "as-welded" and as "heat-treated" will vary according to the five principal factors listed below:

(a) Pretreatment such as the preheating temperature employed.

(b) Technique during the welding sequence.

(c) Admixture of the base metal with the deposit.

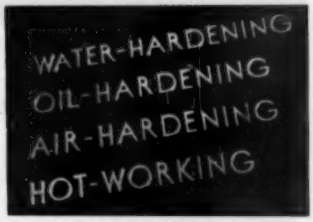
(d) Rate of cooling. Mass of the object being welded acts upon the rate of cooling.

(e) Tempering temperature employed after welding.

Preheating. Proper preheating of units to which tool and die electrodes are to be applied is highly important. Preheating is well recognized as a crack-preventive measure. The degree of preheat is a primary factor in the effect on the hardness developed in weld depositions because it tends to delay the rate of air quenching. For a given condition of welding (current, welding speed, etc.) the cooling rate will be faster for a weld made without preheat than with preheat. Preheating is also beneficial in reducing or preventing shrinkage stresses and deformation.

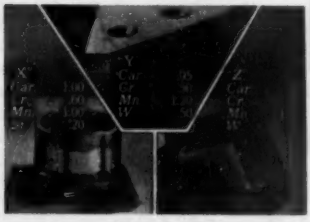
Welding Technique. The technique employed affects the hardness of weld deposits. Reverse polarity d-c is recommended as it minimizes the pene-

THE HUNDREDS of brands of tool steels you can find on the market



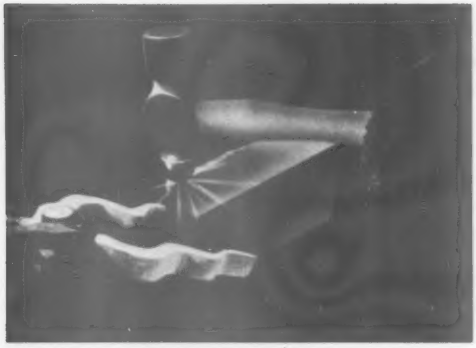
BOIL DOWN to just four classes (read their names above). Now if you take several different brands from any one of these classes—

BRAND "X," say, oil-hardening regular, and brand "Y," oil-hardening non-shrinkable and brand "Z," oil-hardening non-deformable

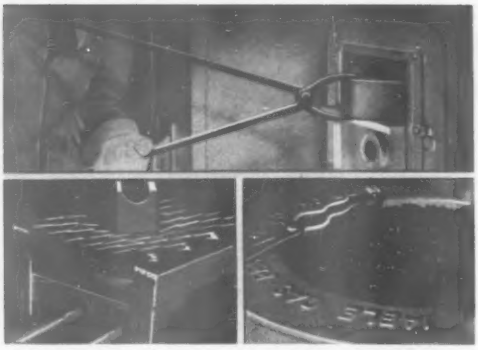


YOU WILL FIND that the recommended heat treatments are the same. Therefore, in tool and die welding, it is not a question of matching the analysis of the steel (it isn't feasible to have an electrode to match each analysis) but of matching the heat treatment

FENDER FORMING DIE shows deposits of alloy electrodes over a large area. This type of alloy electrode belongs in group II of the three categories in which tool and die welding electrodes are divided (see text)



PEENING OF tool-steel weld deposits has a well recognized value. Peening helps to: (1) relieve shrinkage stresses; (2) correct distortion; (3) improve physical properties and (4) refine the metallurgical structure



PROPER PREHEATING and postheating or tempering of deposits are most important. Equipment shown above can be used to do both jobs. Top: controlling furnace; left: gas hot plate; right: gas-fired lead pot

tration of the arc, resulting in less admixture with the base metal.

Select the smallest electrode that will do the job. Less volume of heat is required, which reflects on the ultimate hardness of the deposit.

Arc voltage and amperage both influence hardness. Utilize a close arc and current values conducive to proper penetration. Slightly lower amperages than those used for first passes are recommended on second or finishing beads.

Work positioning, rate of travel and manipulation of the arc may all exert a slight influence on weld hardness.

Ultimate hardness and characteristics of the weld deposits can be enhanced by thorough peening. Extended deposits should not be made before peening. Peening at forging temperatures has an advantage in that hot metal is more ductile.

Admixture and Cooling. The admixture (dilution) of the deposits with the base metal produces weld metal that is alloyed in direct proportion to the alloys contained in the electrodes themselves and the parent metal. Inasmuch as elements such as carbon and chromium are placed in steels to enhance their hardenability, the percentage of these elements influences "as-welded" or "heat-treated" hardness of the deposits.

The rate of cooling after welding, which is governed by the preheating temperature employed and the size of the object being welded, also affects the ultimate hardness. The larger the object, the slower the air quench. Naturally, the preheating temperature utilized also governs the rate of cooling and air quenching.

Tempering. In welding tool steel, changes take place in the steel that require tempering. A heat-treatment man would not think of hardening a tool steel without tempering it afterward. To gain the same results, weld deposits should also be tempered. Tempering yields toughness with very little depreciation of hardness. It refines the grain structure and relieves stresses and strains set up in the welding operations. Temper or draw to suit requirement. Size governs the length of time of the draw, never less than one hour. Do not temper deposits of the alloy types, but stress relieve units on which they are applied. On partial repair, temper according to the draw-range temperatures of the base metal; on a full repair, temper according to the recommended draw-range temperatures for the electrode.

Some knowledge of the basic mechanical principles and fundamental operating details of tools and dies should be acquired. Tool steels are carbon steels to which alloys have been added in varying quantities. Such elements as carbon, manganese, silicon, chromium, nickel, tungsten, vanadium, molybdenum and cobalt are added to steel to meet extra requirements such as: greater wear resistance and hardness; greater toughness or strength; to stabilize size and shape during changes of heat and cold; to impart "red hardness" so the steel will remain hard while red hot.

Because of their diversified composition, the heat treating of tool steels is a complex subject. It is not possible to delve into it to any great degree; however, the fundamentals are important and will be of help to those engaged in tool and die welding. In practical tool and die welding, it is not necessary that the electrode match the analysis of the tool steel being welded. However, in most cases, the welding electrode used should match the heat treatment in its classification as closely as possible. Therefore, such terms as "annealing," "normalizing," "hardening," and "tempering" should be thoroughly understood.

Match the Heat Treatment

Knowledge of the analyses of tool steels is necessary in order to get acquainted with their properties and characteristics. Though there are literally hundreds of different tool steels on the market, four general classes of electrodes (including high-speed-steel electrodes) will generally suffice to weld them. It can readily be realized that it would be impracticable to have an electrode matching each and every analysis or exact heat treatment of the hundreds of brands of tool steel on the market. In welding, however, it is not a question of matching the analysis of the steel but of matching the heat treatment in its classification as closely as possible. In spite of many different trade names, insofar as welding is concerned, there are only four classifications of tool steel: water-hardening, oil-hardening, air-hardening and hot-working.

(To Be Continued Next Month)

WELDING AT FORT PECK

(Continued from page 19)

in matching the completed tee to its other take-off sections, indicating that distortion and shrinkage had been held to a satisfactory tolerance.

Welding Sequence of Grid

The grid section was the piece that afforded the greatest opportunities for difficulties. A careful study of the problem, however, led to the development of a welding sequence that produced highly satisfactory results.

Heavy tack welds, made to assemble the 4¼-in. grid plates to the grid shell, started the fabrication. All of the 4¼-in. plates were in a vertical position when they were tacked to the 2¾-in. shell plates. The weldment was then turned so that the 4¼-in. plates would be in their normal horizontal planes. With the weldment in this position, all of the 3-in. vertical grid plates were tacked in place with the exception of the top and bottom three rows. Then the tack welds joining the 4¼-in. plates to the shell were reinforced with approximately three root stringer passes.

Next, the grid weldment was turned 180 degrees, and approximately three more root stringer passes were made on the opposite side of the 4¼-in. shell welds. The 4¼-in. plates were now firmly but not fully welded in position. The weldment was now rotated 90 degrees, and the 3-in. grid members were welded until approximately one third of the weld groove had been filled. This welding, of course, was done in the flat position.

In general, the welding of the 3-in. grid plates proceeded outwardly from the center plates toward the shell; the weldment was rotated a number of times in order to weld both sides of the grid plate in the flat position. After these welding operations, the last three top and bottom rows of the 3-in. grid plates were fitted in place and root welded.

All of the 3-in. grid plates were now welded completely. Again, welding was started in the center and carried outward, and the weldment was rotated as required to provide downhand welds on both sides of the plate.

When the welding of the 3-in. grids had been completed, all of the 4¼-in. grid plates were welded in the shell in the flat position. These welds were built up in approximately 1/3 steps, starting from the center member and working upward and downward on the weldments with weldors on both ends of the 4¼-in. plates.

When the grid weldment was completed, it was fitted up and welded to the penstock saddle shell plate. This had been previously prepared by flame-cutting and was ready to receive the grid. The grid section was welded to the penstock saddle by manual welding. The weldors kept approximately opposite each other as they worked on opposite ends of the seam. After completion of all the welding, the finished riser tee was again stress relieved.

The final result was a unique weldment weighing 65 tons, of which weight 8,500 lb represented welding electrodes. This huge welding job required over two months of continuous work, involved many hours of welding and necessitated four trips to the stress-relieving furnaces. Despite the apparent difficulties, only welding could offer the ruggedness that the big riser tee had to have.

Make Your Words Wake Up!

No. 11 in a series of inspirational talks on

"Twelve Self-Assignments to Sales Success"

BY RICHARD C. BORDEN

A successful preacher, who considers selling to be a vital function of every man of the cloth, puts it this way:

"To make *my* customers want *my* product, I do more than just present the advantages of buying salvation . . . and the disadvantages of not buying it. I describe those advantages and disadvantages VIVIDLY . . . with the help of powerful picture-painting words, words potent enough to make my parishioners *feel* the fire . . . make them *hear* the harps!"

That's excellent advice for the wording of a commercial sales talk.

How about you? When your selling job requires you to describe to a customer the disadvantages of *not* owning your product, can you do so with fire-feeling vividness? Have you hot enough words and phrases in your vocabulary to make your parishioners feel like moving along the pew a little to get on to a cooler spot?

Here's how a salesman of electric dish-washing equipment uses crackling words:

"The average woman has to wash dishes for 30 years. For 30 years she has to stick her hands into greasy, smelly dish-water, to breathe the disagreeable odors into her lungs, to let that greasy vapor open the pores of her face and ruin her complexion.

"During that 30-year period, she washes 72 stacks of dishes each as high as New York City's Empire State Building. If a man had to do that, he'd stop eating!

"In her 30 years of dish-washing, she wastes 4 solid years of her life, 8 hours a day, with her back bent and her hands in hot water.

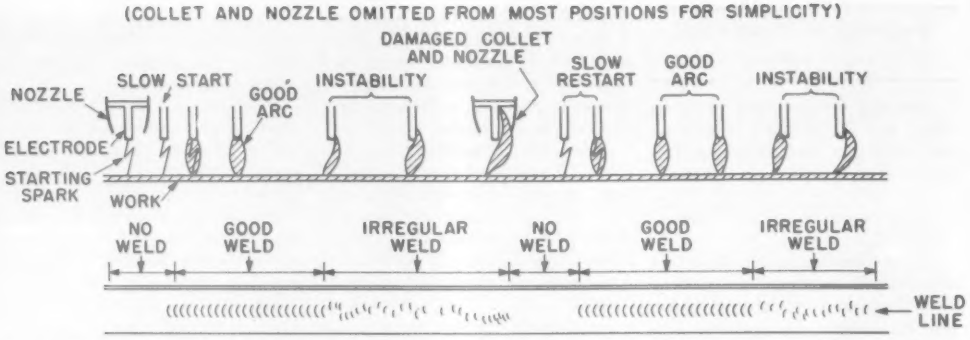
"Why, if any federal judge in America were to sentence a criminal to spend 4 solid years of 8-hour days with his back bent and his hands in hot water, the Humane Society would literally rise up in arms . . . and likely the judge would be IMPEACHED!"

If you lack words of equivalent fire-feeling vividness . . . for use in the kind of selling you do . . . then determine this month to acquire them!

How?

One good way is to read carefully the advertising of the companies whose products you sell. Since the copy used in such ads is created with painstaking care by top-notch word specialists, it stands to reason that you'll be able to pick up from time to time vivid language that you can use to advantage. This month don't pass up that opportunity.

These articles, published every month in The Welding Engineer, *are based on the script of a Dartnell-Borden series of sales films, "Selling against Resistance."*



1—EFFECTS OF poor starts upon welding are shown by the weld line at the bottom. When there is no arc, no welding can be done. An unstable or wandering arc may damage inert-arc torch besides giving irregular welds

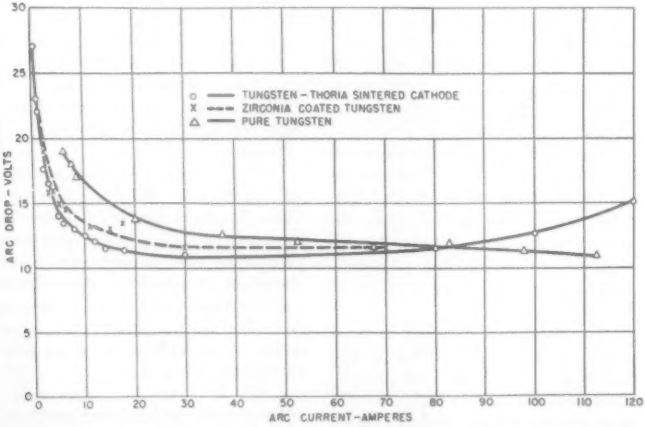
Electrodes that Stabilize

The problem of arc ignition and stability with tungsten electrodes is important today because of the great increase in use of the inert-arc welding process.

BY J. D. COBINE AND C. J. GALLAGHER
General Electric Research Laboratory, Schenectady, N. Y.

BEFORE we describe new tungsten electrodes that eliminate some of the difficulties of arc ignition and lack of stability from inert-gas welding, let's see what happens when an arc is struck with the usual type of electrode.

The conventional inert-gas welding electrode is of some non-consumable material usually tungtsen. (The inert-arc metal-arc process where welding is done with a consumable electrode will not be discussed here.) Starting is accomplished either by contact with the work or by a high-frequency spark. With spark starting, the ignition of the arc may be quite erratic, depending on the previous history of the electrode. If the tungsten is cold, the arc may not form immediately or may not form at all. If it does form, it may be extremely mobile, with the footpoint moving rapidly over the tungsten surface. In an automatic welding set-up, this type of behavior can lead to expensive losses in both time and material.



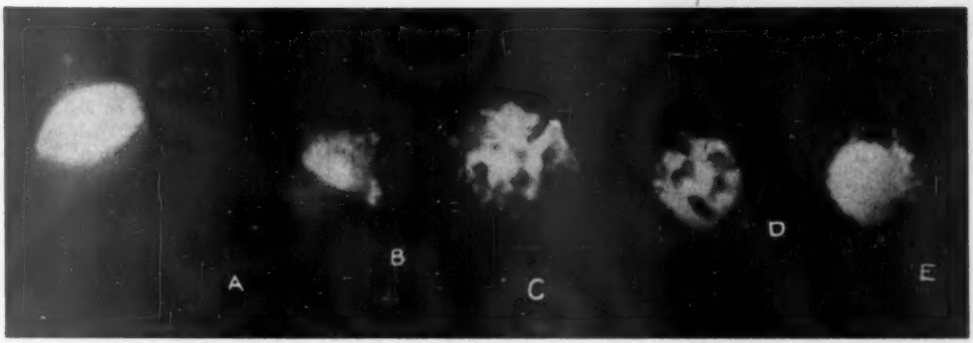
2—VOLT-AMPERE characteristics of arcs in argon. Arc length equals 0.1 in. Significant differences appear only below a current of 50 amperes

The little sketches of Fig. 1 suggest what can happen when starting the arc with a normal tungsten electrode. The upper line shows welding conditions such as slow start, good arc, instability, slow restart, etc., while the lower line depicts the effects of these various conditions upon the weld. In addition to poor welding, an unstable arc may cause damage to the welding torch.

The fundamental cause of the phenomena described lies in the nature of the current transfer at the tungsten surface. Since the wandering occurs only on straight-polarity welding where the tungsten is cathode, it is clear that we must inquire into the nature of the cathode spot on the electrode.

Thermionic and Cold Cathodes

For our purposes, we may consider briefly two types of cathode; namely, the thermionic and the cold cathode. A thermionic cathode is one which operates at a sufficiently high tem-



3—CATHODE SPOTS on ⅛-in. inert-arc electrodes; (A) pure tungsten; (B) zirconia-coated tungsten; (C) a thoria core in sintered tungsten tube; (D) thoria core in copper tube; (E) sintered tungsten thoria electrode

Inert-Gas Arcs*

perature to supply the required current on the basis of the Richardson-Dushman law[1]. A cold cathode, on the other hand, does not require such a high temperature; the current is supplied by a mechanism that is not fully understood. It does appear that for a cathode spot to exist on a cold cathode, some oxide must be present on the surface.[2,3]

In straight-polarity inert-gas arc welding, the tungsten electrode may serve as either type of cathode, depending on the operating conditions. When starting is attempted with a cold electrode, evidently an arc cathode spot cannot be established unless there is some oxide present. If the arc does start, there are two possible conditions, depending on the amount of oxide present and on the electrode current density:

(1) If there is sufficient oxide, the cathode spot will stay on the tip and, if the current is great enough, the cathode will become a thermionic emitter as its temperature rises.

(2) If there is not enough oxide, the cathode spot will quickly clean the surface at the spot itself and then wander to new oxide-bearing regions. This cleaning action and wandering can take place with great rapidity, before the electrode has become heated to the thermionic condition.

If the arc does not start, it is probably because there is no oxide present. The high-frequency spark itself cannot establish a thermionic spot. The condition of no oxide on the electrode can easily be obtained if the electrode has once been operated and then allowed to cool in the inert atmosphere. Cooling in air does not solve the problem, since the oxidation is difficult to control and may produce a dirty weld on the next try.

For straight-polarity welding (electrode negative), the solution to the problems discussed above has been found in the form of specially prepared welding electrodes in which a highly-refractory oxide has been supplied by several methods. These electrodes give reliable firing on high frequency with little or no delay and subsequent arc wander. They have in addition, other desirable properties, such as low pick-up voltage and a greatly extended current range compared to tungsten.

Types of New Electrodes

Zirconia: One group of electrodes uses zirconia (ZrO_2) for the oxide, either as a coating or as a core. When used as a coating, the zirconia is applied to a tungsten rod in a thin coating, 1 to 3 mils thick, with a suitable binder such as waterglass. Suitable high-temperature firing produces a hard, tenacious coat. As a core, the zirconia may be used in a shell of almost any metal, such as tungsten or tantalum or of the low-melting-point materials: copper, aluminum or stainless steel.

Thoria: A second group of electrodes makes use of thoria (ThO_2). The thoria may be used as a coating on tungsten, but best results were obtained when it was used either as a core (again in any of the metals) or as a component in a sintered material. The sintered electrode was made by extruding and firing a ball-milled mixture of thoria and tungsten powder. The optimum proportions appear to be about 15 parts of thoria to 100 parts of tungsten.†

Insofar as welding is concerned, the important properties of the new electrodes are:

1. Low open-circuit voltage required for reliable starting;
2. Large current-range for a given size of electrode;
3. Low arc voltage over the operating range of current;
4. Low rate of consumption of electrode material.

Lower Voltages, Wider Range

Items 1 and 2 are summarized in Table I for arcs in argon. Note that the thoria-tungsten and zirconia-tungsten electrodes require much lower open-circuit voltages and also that the current range is extended considerably over that of pure tung-

*Abstract of paper presented at the Winter General Meeting of the American Institute of Electrical Engineers, New York City, Jan. 22-26, 1951.

†High-thoria type. There is also a low-thoria type of commercial electrode with a thoria content of about 1%.—*Editor.*

Table I. Electrode Characteristics for Arcs in Argon

	Pure Tungsten	Zirconia-Tungsten	Thoria-Tungsten
Open-circuit voltage for starting with h-f spark (volts)	190*	40	25
Current range (amp)			
1/16-in. diameter electrode	65-150**	6-200	——
3/32-in. diameter electrode	140-280**	——	6-375

*Approximate, **Values given by H. A. Huff, Jr., and A. N. Kugler, "Practical Aspects of Inert-Gas Welding," *The Welding Journal*, volume 28, 1949, page 129.

sten. The minimum current for the thoria-tungsten electrodes can be made as low as 0.2 amp by using a smaller size electrode or by pointing a larger one. These low currents may be of interest in special welding applications.

With the low-melting-point metals, the maximum currents are lower than those of the tungsten-base materials. For example, with a copper tube with thoria core, the upper limit is about 150 to 200 amp. This holds for outside diameters of about 0.125 to 0.1875 in. where the cross-sectional area of the core is about one half that of the copper. When the low-melting-point metals are used, some of the metal vapor may appear in the arc, especially at the high end of the current range.

The volt-ampere characteristics of arcs in argon for three types of electrodes are shown in Fig. 2. In each case, a water-cooled copper anode was used. Significant differences appear only below about 50 amp, in which case the drop is highest for tungsten and lowest for the sintered tungsten-thoria. The voltage drop increases at the high-current end of the tungsten-thoria electrode curve, probably because of the increased IR drop, since the resistivity of the sintered material is about twice that of tungsten at the operating temperature. It was possible to start the arc with zirconia and thoria electrodes at any currents, but the tungsten would start only at higher currents.

Cathode Spot Phenomena

The rate of consumption of material for all electrodes is, in general, less than for tungsten. With helium, slightly higher rates of loss are observed, due to increased heating and possibly to less efficient repression of cathode evaporation by the lighter helium atom.

Let's now look at some differences in the appearance of the various electrodes that may throw some light on the mechanism of the cathode spot. Figure 3 shows photographs of the cathode spots on five different electrodes operating in argon at a current of 40 amp. The copper anode was moved slightly to one side to permit end-on viewing of the cathode.

A pure tungsten electrode is shown in photo 3A. The "spot" appears to consist of two zones; a very hot, probably molten, zone in the center is surrounded by a highly luminous ring of lower temperature. If the current is divided by the area of the inner zone, a current density of 4,600 amp/cm² is obtained. If one uses instead the total luminous area, the current density is 2,940 amp/cm². If we assume that the tungsten is a thermionic emitter at 4,000 K, the Richardson-Dushman equation gives a current density of 3,600 amp/cm². It seems reasonable to assume that the tungsten is a thermionic emitter at a temperature above 4,000 K.

Thoria and Zirconia

Photo 3B shows an end-on view of a tungsten rod coated with zirconia. Again, two zones appear at the cathode spot. As observed, the area in the center was not molten but was covered with an intense blue glow. This is apparently the primary emitting area and corresponds to a current density of greater than 40,000 amp/cm². It seems highly improbable that such a current density could be supplied by thermionic emission.[3] The zirconia-coated electrode appears to emit electrons by some "cold" cathode mechanism requiring an oxide layer, which is not fully understood.

The effect of the thoria is different from that of the zirconia. The thoria-containing electrodes are shown in photos 3C, D and E. Measurements of the current density on the thoria-cored copper tube (3D) lead to a figure of about 2,700 amp/cm². The observed temperature was about 3,300 K. The thermionic current density calculated for thoria at this temperature is 3,700 amp/cm², which is in reasonable agreement with the observed value, considering uncertainties in the temperature and thermionic constants.

The cathode spot on the sintered tungsten-thoria electrode is shown in photo 3E. The measured current density of 2,320 amp/cm² is again in reasonable agreement with the calculated value. Thus the function of the thoria appears to be that of providing a low work function surface, so that the required current can be supplied by thermionic emission at a temperature much less than would be possible with tungsten.

Acknowledgments: The authors acknowledge with thanks the assistance of M. R. Many in preparing much of the electrode materials, and also the coöperation of E. F. Potter, A. E. Near, and N. A. Chapin in testing them under practical conditions.

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[1]Gaseous Conductors, J. D. Cobine, p. 107, McGraw-Hill Book Co., New York, N. Y., 1941.

[2]Arc Discharge not obtained in Pure Argon Gas, G. E. Doan and J. L. Myer, *Phys. Rev.*, Volume 40, 1932, pages 36-39.

[3]Current Density of the Arc Cathode Spot, J. D. Cobine and C. J. Gallagher, *Phys. Rev.*, Volume 74, 1948, page 1,524.

"It's very helpful on remodeling jobs."

Welded Towers for Television

BY ROBERT A. HUNERWADEL
Manager of Sam Pats Garage, Chattanooga, Tenn.

TELEVISION waves, unlike radio waves, do not follow the curvature of the earth's surface but continue outwards in a straight line. The farther you get from the station, the higher up in the air the waves are located. That makes high antennas a must for good reception, particularly in rural areas.

Some time ago a friend of mine started constructing a television tower from aluminum angles. His time and material cost put our minds to work on the problem of designing a stronger, cheaper tower. With television sets selling like hot cakes, we figured that there would be a ready market for all we could produce.

At present, we're turning out all-steel, all-welded television towers in 10-ft sections cheaper than any of our competitors can make them. The sections consist of a 10-ft base, a 10-ft top and as many center sections as are needed for the recommended height. All of the sections are alike except the top and bottom sections, which are tapered.

The cost of a tower naturally varies with the number of sections, but the top and bottom sections cost more than the center ones. When a tower reaches 60 ft or more, it costs the customer less than $1 per foot. We sell mostly through television dealers located in the Chattanooga area.

We fabricate the sections in our shop, truck them to the location and begin assembly by bolting the base to a previously poured concrete slab. Then we start climbing and stacking, 10 ft at a time. The sections are joined together at the site by bolting. We have erected towers of heights from 40 to 110 ft, the latter being the highest to date.

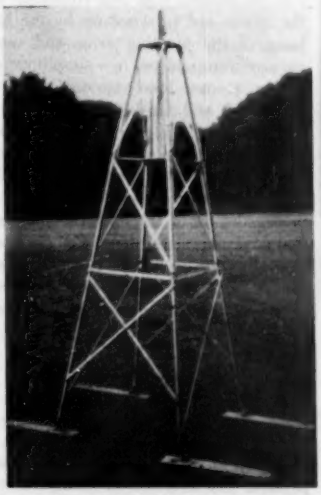
The tower sections are constructed of structural steel tubing, 14-gage plates and ⅛ by ½ in. strap iron. The latter is used as reinforcement to make the tower more rigid. Each 10-ft tower section is an elongated triangular prism, with three pipes marking the corners of the triangle. The tubes are held in place by welding them to the reinforcing straps and to triangular gussets cut from 14-gage plate. The gussets are located halfway between the reinforcing straps.

TOWER SECTIONS, each 10 feet high, are bolted together as the tower goes up. Bottom section is bolted to studs in a concrete base

WELDING SECTIONS from steel tubing and triangles cut from plate

It makes a simple, practicable tower, one that is sturdy enough to withstand the highest winds if properly guyed. We also construct a 5-ft roof stand (picture at lower right) for houses on the mountains where towers aren't necessary. The four flat bases swivel to fit a roof of any pitch.

Photographs courtesy of Hobart Brothers



ROOF STAND built for a mountain house where a tower isn't needed

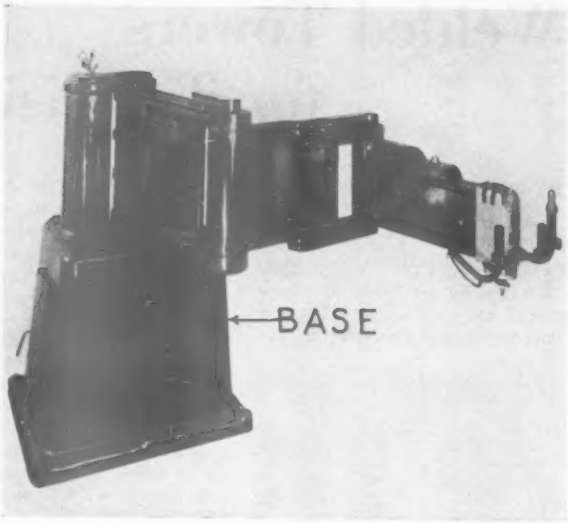
OLD 47%

Here's an example of what a machinery designer can save by converting to welded steel. Compare the photos and drawing on the left with those on the right-hand page.

BY CHARLES G. HERBRUCK
Assistant Secretary, The James F. Lincoln Arc Welding Foundation

GOOD design in changing the base of a radial drill and arm router from cast iron to welded steel has reduced manufacturing costs 47% for the Onsrud Machine Works, Chicago.

This router (Fig. 1) was originally developed for the aircraft industry but is now widely used by metal fabricators in all types of industries. Rising material and labor costs forced Onsrud to seek other ways to design the base.



1—RISING MATERIAL and labor costs forced the designer to find another way to design the base of a radial routing machine

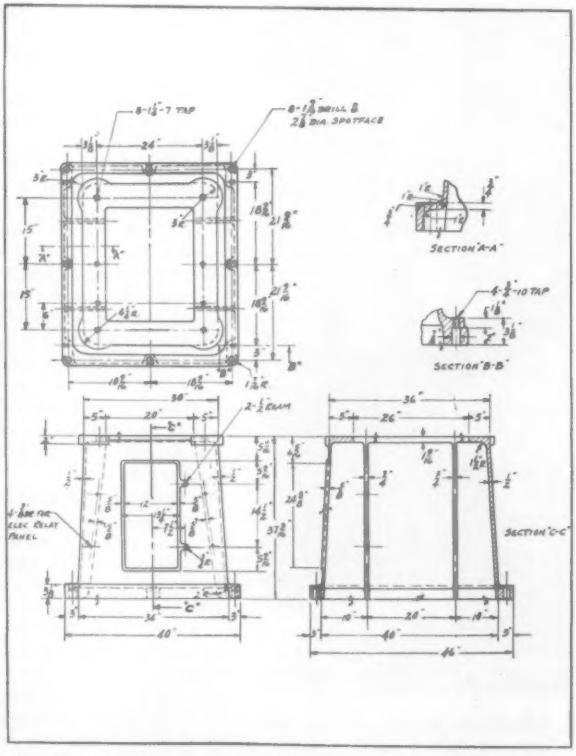
THE ORIGINAL DESIGN

The original casting had a simple exterior but the interior was well ribbed to withstand the strain and twist set up by the long overhang of the pivoting arms and motor. The savings were realized in a simplification of the design to use less material and cut down machining and finishing time. In addition to the usual grinding operations in finishing, castings necessitated the added operation of filling depressions, holes and other defects to obtain a smooth surface.

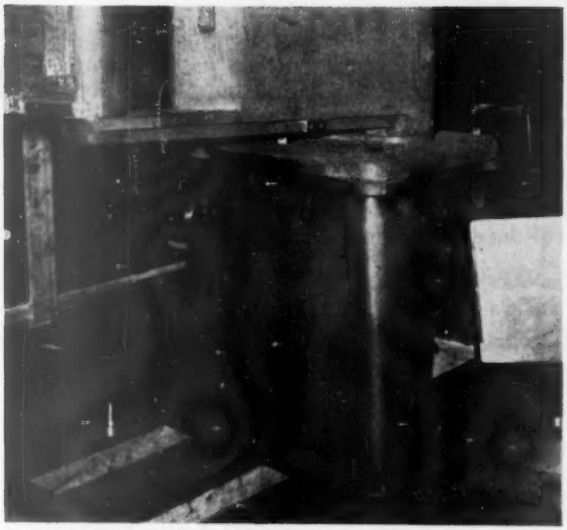
The details of the cast-iron base are given in Fig. 2. Base has a side wall thickness of ½ in. increasing to ⅝ in. The top cored slab is 19/16 in. thick and is supported by inside ribs ¾ in. thick. The bottom itself is 3⅛ in. thick.

THE WELDED BASE

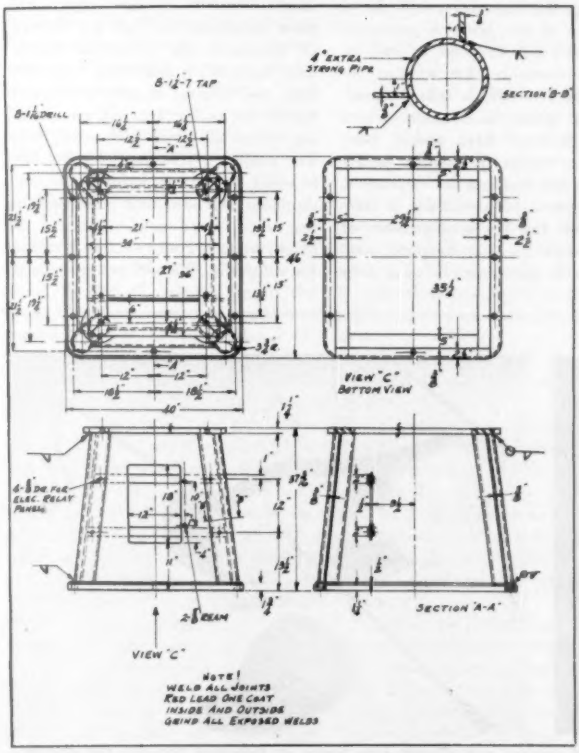
Compare the design shown in Fig. 2 with the welded design for the base, Fig. 3. Because of the greater tensile strength of steel compared to cast iron (65,000 compared to 20,000 psi), the side walls of this base are reduced to ⅜-in. plate.



2—PLAN VIEW, elevation and detail of the original cast-iron base. Note the ¾-in. stiffening ribs needed inside (section C-C)



4—WELDED STEEL BASE is attractive. It weighs 50 lb less than the cast-iron base but saves about 50% in cost of material



3—DRAWINGS for the welded steel base. Side walls are ⅜-in. plate and internal ribs have been eliminated. Note corner pipes

NEW

The inside ribs are now eliminated. To offset the loss of the ribbing, double-extra-strong 4-in. pipes are welded at the corners (as shown by section B-B) to join the side walls and the upper and lower flanges. Bottom flange is 1¾-in. plate; top flange 1¼-in. plate. The corner pipe stiffeners add strength and help to produce a vastly improved and stronger base. Originally, beaded corners were used on the welded base (see sec. B-B, Fig. 3). To give the machine a more modern and attractive appearance, however, the ⅜-in. plates were moved out an additional inch so as to become tangential with the pipe, Fig. 4.

In building the fabricated base, continuous welds are used throughout because of better appearance, even where strength requirements do not necessitate such heavy welds. To insure accurate alignment, parts are jigged for tacking purposes and are subsequently positioned so as to permit as much downhand welding as practicable.

The bars making up the foot of the base are the first pieces to be assembled by tack welding. A continuous bead is deposited around the outside edge to insure a finished appearance. Heavy tacks are made on the inside at intermittent intervals to balance this bead.

The upper face is fabricated from four bars of 4½ x 1¼ in. stock. These bars are mitred at 45 degrees so as to fit snugly in the mitred joint welded. Lugs cut on a 4-in. radius are welded on the corners for the sake of appearance. The top and bottom sections are now placed in a jig, and the 4-in. extra-strong pipe spacer is fitted between them and securely welded in place.

The frame is now ready for covering. This is done by welding ⅜-in. plate diaphragms, previously flame-cut to fit between the pipe spacers. The weld bead between the pipe and plate is ground smooth, making it impossible to detect a weld joint. The pleasing appearance of the finished base may be seen in Fig. 4.

Although weight of the welded base is reduced by only 50 lb, the cost of material is reduced approximately 50%. Pattern costs are eliminated, and full freedom for design changes is achieved.

Machining time is cut exactly in half by the welded steel construction. On the cast base, the bottom footing and top finished slab required a roughing and finish cut. On the steel design, however, the welding jig is so accurate that it is possible to machine both top and bottom surfaces with one light cut. It is also unnecessary to finish the doorway opening and to spot face the floor bolt holes.

Weld grinding on the steel base is done in approximately 37% of the time required for filling and sanding of the cast base.

TRANSPARENT plastic goggle protects eyes from flying particles

Guarding Eyes

Some employers continue to supply workers with old-style safety goggles simply because they are unaware of the developments of the postwar era in goggle research work and design. They think that they are providing adequate eye protection when they are not. It isn't enough to supply goggles wih approved lenses; you must also supply a comfortable, good-looking goggle that workers will be glad to wear. This article gives you some helpful pointers.

BY JACK LAMBERT

EACH YEAR 300,000 eye accidents happen to American workers on the job, mainly because ordinary protective precautions have not been taken. The estimated cost of these accidents has been conservatively placed at $200,000,000.

Eye-Accident Frequency

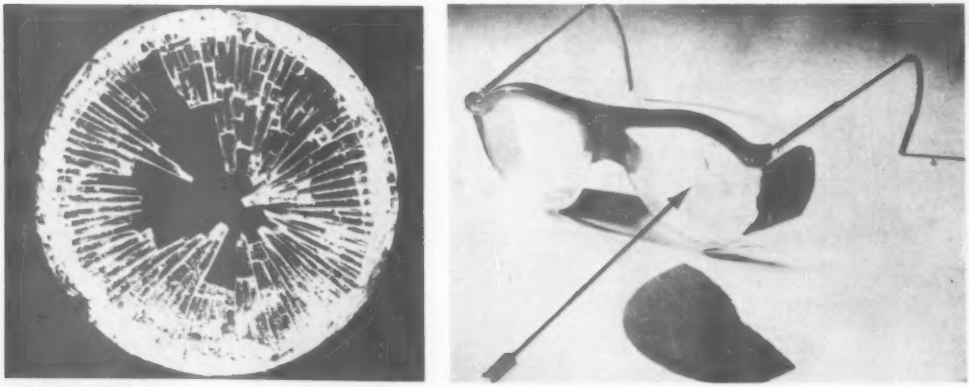
The American annual welding accident incidence picture looks about like this (in order of frequency of injury):

170,000 to the hands
115,000 to the head (except eyes)
100,000 to the eyes
95,000 to the toes

The average frequency rate of disabling eye injuries in welding has been put at 0.67 man-hours. Owing to the widespread nature of welding operations, these figures are significant to every fabricator of metals.

Let us modify somewhat some of the things that have been said above. The eyes of the *properly protected* weldor are not exposed to eye injury. Furthermore, the welding industry, as a whole, is safety conscious. The plants and shops where welding is done have always been willing to adopt preventive safety measures and methods for employees, including the widespread use of safety goggles. But the managements of many shops are not keeping accidents to a minimum because they think they are providing adequate safety goggles when they are not.

Safety goggles must not be confused with welding goggles and welding lenses. The welding industry has always done a good job of providing those. Research by the optical and glass industries, the National Bureau of Standards, the American Standards Association and other organizations has resulted in well established specifications for arc and gas welding under all types and conditions. The subject of the proper color hue to select for various welding and cutting jobs has been well publicized in the trade press and is treated at length in such books as *The Welding Encyclopedia*. We will not go into it



GLASS LENS (left) shattered under steel ball impact test. Plastic lens broke as indicated but did not shatter

with Plastic Products

here except to say that glass is still the medium that must be used to protect eyes from injurious radiation.

What we *will* talk about is the type of goggles that are made to keep out foreign particles from the eyes. In welding work, you will need such goggles when you do grinding or chipping jobs. Not enough care is taken, in too many cases, in selecting the right safety goggles. If we are to get the welding production rate that will be called for in our defense program, we simply cannot afford to have disabling eye accidents. Employers who continue to supply employees with old-style goggles must be re-educated.

Great progress has been made in designing safety goggles for almost every need. For instance, only ten years ago the only chipper's goggle available was the dual-cup design. New goggles designed for chipping now include several types of plastic coverall goggles and a semicup "tucaway" goggle, assuring much better protection. The same is true of goggles for many other jobs and fields.

"TUC-AWAY" LENS types: regular side shield for ordinary hazards, a full side shield and a new semicup lens that gives wearer over 90% protection

Three Points to Look for

If the objective of the employer is to reduce welding eye accidents, he must, first of all, select properly the type of modern improved goggle best suited to the particular job involved. Especially is this important now when the defense production program is getting under way throughout industry. This writer has found that many industrial plants are re-examining the whole problem of goggle selection.

What are the points to look for? Point one: the goggles must be designed for comfort. If they are chipping goggles, worn under a welding helmet, they must be so comfortable that the weldor will be able to wear them without thinking about it. That means that they must be of light weight, fit properly and meet recognized standards of optical quality.

Point two: the goggles selected must have passed all government tests.

Point three: the goggles must be made for long wear. Recent advances in achieving materials of longer wear have been notable. This brings up the important question of the material to be used. Should the goggles be made of plastic or of glass? (Suggested reading on this topic, "Plastics on Guard", George T. Metcalf Co., 68 So. Main St., Providence 3, R. I.)

Truth about Plastics

Regarding the plastic or glass question, plastics are becoming more and more widely used for purposes of eye protection. It is time that we pause and take stock of the effectiveness of plastics. Do plastic lenses measure up to glass? Are they better than glass? Are all plastics equally suitable? What are the advantages, if any, of plastic safety goggles?

The questions may be answered thus:

(a) Plastics are light and accordingly bring more comfort to the wearer.

(b) Because of their structural qualities, they resist better, in many cases, dangers to which the worker is exposed.

E. A. Ring, treasurer of the Watchemoket Optical Co., a firm that has played an important part in the new plastic developments, said to the writer:

"Plastic eye protection has finally reached the important position it has long deserved in the welding safety field. It has consistently proved itself in industry by meeting the most rigid job requirements. In order to satisfy most job requirements, eye protection must be safe, comfortable and good looking (highly styled). The latter two points are considered very important by safety engineers who want to induce more workers to wear the goggles provided. Eye savers made of plastic satisfy all of these job requirements.

"The viewpoint of the average designer or manufacturer of plastic eye protection is: How can we improve existing goggles and give better protection to workers? How can we best adapt and improve plastic material to its important task in the safety field, always bearing in mind that what is new today may be standard tomorrow?

"The challenge is to see how the plastics industry can best interpret the demands of industrial workers as a whole, and also meet existing standards for impact and optical tests. In short, we want to provide industry with the finest eye protection available!"

Today the plastic goggle is supplied in various styles and types—as, for instance, the coverall, face shield and tucaway designs. Each is made to give maximum protection at a specific job.

The trend toward plastic safety goggles has been steady in recent years. Since all-out production is currently impending in the machine trades, including welding, an evaluation of plastic eye protection should serve a useful purpose now.

Recent reports of the National Safety Council bring out these facts:

The all-plastic safety goggle has been viewed with increasing favor during recent years in the machine shop field. The lens area is generally

(Continued on page 56)

TRAINEE FLOYD ELSASS makes gas welds as called for in the fourth week of the six-week welding course

COLLAPSIBLE canvas booths are set up for as many students as are scheduled to work on arc-welding jobs

TENSILE TESTER determines the breaking-point strength of a weld

BENDING machine with three-ton hydraulic jack (left) and tensile tester are used on weld samples

Gas Company

This is the pattern of operation and equipment for a successful and extremely practical course of training for very specialized welding requiring great skill.

BY FRED M. BURT

PIPE-LINE welding is important to the operations of the Southern Counties Gas Company, Los Angeles. This $80,000,000 company has 4,856 miles of transmission pipe line to supply 329,235 domestic and industrial customers through eight distribution divisions in Southern California. With its sister operating company, Southern California Gas Co., it is supplied with natural gas piped from Texas fields through the new 1,200 mile, 30-in. line to Blythe (Arizona-California border) and the 214-mile, 26-in. line that brings the gas from Blythe to the Los Angeles area.

Pipe-line welding on the transmission lines and the making of customer connections and connections at storage units add up to a lot of work for weldors.

Southern Counties meets this demand by training its own weldors as they are needed. Since the company's welding school was started in 1941, well over 200 men have received very complete training in pipe-line welding from Walter C. Hutton, the company's welding supervisor. As a rule, a class runs from a minimum of four men to a maximum of eight, with six men the "ideal" number. At times an anticipated need for a weldor or two in some division may call for a very small class. At this writing a one-man class is receiving full training. This student is Floyd Elsass, of Santa Barbara, who started just before the last full class graduated.

A new class is started whenever a need for more weldors is anticipated in any of the divisions. The "raw material" is recruited (voluntarily) from many categories, such as field mechanics, field clerks, crewmen, helpers, etc. Construction work inspectors are often given a portion of this course as inspection of work done by outside contractors frequently requires the ability to judge the quality of weldments.

After graduation as fully qualified pipe-line weldors, the men may go back to work in their previous classification until they are needed as weldors, which generally occurs in a relatively short time. The welding educational course is, of course, valuable to employees as well as to the company since it aids them in obtaining promotions. In various supervisory positions in field construction work,

RECESS at right of bell hole is for practicing service connections

BELL HOLES ARE provided to simulate field welding conditions. Trainee Ebass is about to enter the center bell hole to start gas welding pipes

Trains Its Own Weldors

a good knowledge of welding is essential.

Before applicants are accepted for the schooling, the personnel department gives them a preliminary test to determine aptitudes for this type of work. The test is to show up adaptability rather than developed skill. The percentage of men eliminated is not large.

Earn While They Learn

The course of welding instruction lasts six weeks. Trainees attend eight hours a day (8:30 a. m. to 4 p. m.) for five days a week. Each man who attends draws the pay of his job classification while the course lasts.

In this specialized course, little attention is paid to the study of theory. The objective is to impart a good competence in arc and oxyacetylene pipe welding. In the gas company's pipe-line installations, angle welding is not needed except for emergency or temporary measures. Hot wrinkle bends, cold bending and welding fittings are used to change the direction of the pipe.

The entire course of instruction is devoted to backhand welding. Forehand welding is covered only where it has decided advantage over the backhand method such as in overhead welds in confined spaces or fillet welds made to attach service nipples to the side of the main (see photos).

First week: On the first day, the student is given general instruction on how to set up, adjust and light oxyacetylene welding and cutting torches. Each student is checked to make sure that he has learned this lesson. Then the student prepares a beveled slot in 8-in. standard pipe that he may use in practicing backhand welding in the flat position. When he has cut a satisfactory slot, he devotes the balance of the day to practicing welding.

On his second day, the student continues to weld in the flat position. Gradually, however, one end of the pipe is raised (as fast as the individual is capable) until the axis of the pipe is vertical, and the welding progresses downward.

On his third day, the student starts overhead welding on the same set-up. On the fourth day, he starts rolling welds on 2-in. roll-cut nipples. The last day of the week is devoted to practice on all of the above, concentrating on the exercises where welding is most needed.

Second week: To the ground covered in the first week, the student adds ¾-in. nipple rolling welds and attaches a simulated service tee to a 2-in. main. He continues this practice through the fourth day.

On the fifth day of the week, a progress test is held to ascertain which candidates show sufficient aptitude so that they can reasonably be expected to complete the course with a final grade of at least 70%. Any candidate who does not meet the minimum requirement of the test is returned to his division and automatically resumes the duties he had prior to his entrance into the welding school.

Third week: The students start bell-hole welding (at first without pressure). They add service nipples to main butt welds and patches. Later they start work on a live main at 6 psi pressure and add service nipples above ground. All work under pressure is to be started by each individual above ground before he attempts pressure work in the bell hole. Weldors work in rotation in three practice bell holes.

Another assignment for the week is to flame-cut a hole in the live main and repair the leak under pressure. The student also cuts another hole and repairs the leak with skinner leak clamp and patches.

Fourth week: Braze welding is taught to fit in with the above work. The student also learns how to install and tap ¾-in. service tees. This lesson is not given to those who have had previous experience with the tapping procedure.

Fifth and sixth weeks: In his fifth week, the student devotes a good

CLASSROOM for instruction sessions. On blackboard are currents and voltages for four sizes of electrodes

WELDING AREA. On left is 200-amp gasoline-driven welder; at upper right are four oxyacetylene stations

share of his time to position welding (overhead and vertical). He starts practice on hand-cut joints to develop the technique. He also practices fillet welding on plates.

In the final week, the student welds pressure control fittings and tests for leaks. On the last day, the students make their test welds. Coupons are cut from these for tensile and bend tests.

In addition to conducting the welding class, Welding Supervisor Hutton keeps records on all working weldors, both contractors' and company's, and has charge of giving semiannual tests to them and recording the results in order to check on their continued competence. As another part of the program of constantly trying to improve the quality of welding work done, he investigates and promotes better methods of welding in the field, working in conjunction with the engineering department.

The need for the best welding practices is made apparent by the fact that the pipe lines carry very high gas pressure. The 26-in. line from the compressor station at Blythe carries 805 psi; the 16-in. line from the Goleta field near Santa Barbara, Calif., a little more than 1,000 psi. Other lines carry lesser yet still high pressures.

The progress tests held during the welding course show up the weaknesses in a man's cumulative welding competence. If his faults can't be corrected, or if his general unfitness for becoming a weldor is demonstrated, he is dropped from the class. Though this has happened, the percentage of men dropped is negligible.

Arc and Oxyacetylene Equipment

The school is conducted in a space 30 by 60 ft in the rear end of the main building of the general repair shop. Permanent equipment includes a 200-amp portable d-c arc welder powered with a 4-cylinder jeep gasoline engine and a 300-amp d-c arc welder, electric-motor driven. These welders may be supplemented when required by two other 200-amp d-c welders and another 300-amp welder. Voltages of 440, 220 and 110 volts are available in the shop.

There are four oxyacetylene stations: the two on the inner wall have two outlets each, and the two on the outer wall have three outlets each. The extra outlets may be used for hose lines running to an outside area of 20 by 40 ft, where they are connected by piping for oxygen (green) and acetylene (red) to manifolds outside. The oxygen manifold consists of two 4-cylinder banks and the acetylene manifold of two 3-cylinder banks. Other lines (brown piping) carry compressed air at a pressure of 125-140 psi.

A steel work table in the center of the room holds a plain vise, a pipe vise and two testing machines. One of these is a bending machine with 3-ton hydraulic jack and standard radius dies; this is used to test ductility, penetration and soundness of weld coupons. The other machine is for testing tensile strength.

The "laboratory" also has a double pedestal grinder and oxyacetylene service cart with a drawer to hold hose and several torches. When arc welding is to be done, the required number of collapsible welding booths is set up in the aisles.

Artificial Bell Holes

The outside area has three bell holes to simulate field welding conditions. Two of these are 2½ ft wide by 3½ ft long. One of these two has a narrow side recess (1 ft wide by 2 ft long) that is used for practice in making welding connections as from the main line to a domestic customers' service line. The other bell hole is 3 by 6 ft and is used for larger fittings. Trainees learn how to make attachments under line pressure as they would have to do in field work.

In actual field work, a high degree of welding skill is required to hook servicing lines to full-pressure main lines. For instance, a service connection to the 1,000-psi line requires a reducer-regulator to bring the gas down to working pressure. When the spot where the main line is to be tapped has been selected, a hole of 21/64-in. diameter is drilled for location, not piercing the pipe. Around this spot a drilling nipple is welded to the pipe. The hole is then drilled into the high-pressure pipe line, while a special valve on the nipple stops the gas flow. After the necessary pipe connection has been made on the other side of the valve, the valve is opened. An oversimplified description; it isn't as easy as it sounds. All such work is done under the proved safety methods taught to weldors.

The pictures that accompany this article were taken especially for it by Charles Johnson, sales engineer of the Victor Equipment Co.

Tough as they come

THE BEST IN MATERIALS AND WORKMANSHIP

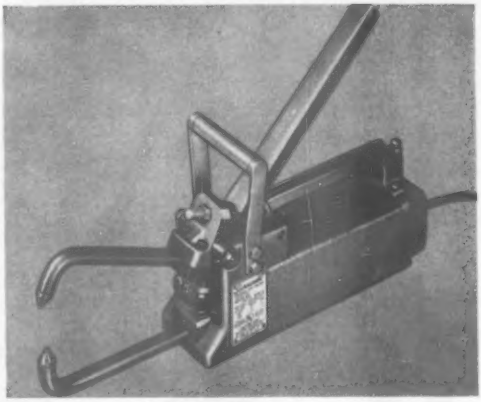
Ask your welding supply dealer to show you the Atlas line. You'll recognize the superiority of Atlas design and workmanship. 27 models of various weights and sizes.

Atlas WELDING ACCESSORIES CO.

707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICH.

New products

STREAMLINED case encloses voltage control and wire feed on a new semi-automatic submerged arc welder



GREATER combined thickness of metal sheets (up to 3/16 in.) can be spot welded with improved NCG welder

Semi-Automatic Welder for Smaller Shops

THE labor-saving and high weld-quality advantages of semi-automatic welding are available to small industrial plants or the average job-shop with the UWM-1 a-c and d-c semi-automatic welder. Components of the welder are the welding head, a voltage control box and a 75-lb capacity spoke-type rod reel handily mounted on a small steel chassis equipped with casters and a lifting eye. A 17-ft flexible hose connects the gun to the welding head. A lightweight hopper that holds 3-lb of welding flux is part of the gun assembly.

Constant welding voltage is maintained, Linde claims, even though the weldor doesn't hold the gun at a uniform distance from the workpiece—the series-type motor voltage control keeps it within close limits. Once the UMW-1 is set up for welding, the company says, any slight adjustment in welding conditions can be made from the control panel. Welding starts when the rod is scratched on the workpiece and stops when the rod is lifted away.

THE LINDE AIR PRODUCTS CO., 30 East 42nd St., New York City 17.

* * *

New Rustfree Steels Save on Critical Alloys

HIGH tensile strengths, high ductility and fully austenitic structure are claimed for a new group of "Super Rustfree" steels. In the hot rolled, fully annealed condition, the ratio of yield strength to tensile strength is 75,100 to 95,300 psi. The non-magnetic properties of this steel are maintained in a cold finished wire of 0.004-in. diameter and of 300,000 psi tensile strength.

These steels are said to have improved corrosion resistance to sulphuric acid, being in the "A" classification at room temperature and "B" classification at elevated temperatures.

These steels are said to save considerably on critical alloy metals since they don't contain cobalt, columbium, titanium or zirconium and do contain considerably less nickel. All these steels are weldable and some can be used as filler material.

UNIWORLD RESEARCH CORP. OF AMERICA, 1302 Ontario St., Cleveland 13.

* * *

New Hard-Facing Rod Features Fast Deposit

A 25% faster deposition rate is claimed for "Ranite B-X", a new hard-facing electrode. This faster deposition has the added advantage of decreasing heat input into the parent metal by one third so that distortion and locked-in stresses are cut way down. This is especially important in manganese steels, since high heat greatly reduces their toughness. Dilution is said to be minimized.

RANKIN MFG. CO., 3072 West Pico Blvd., Los Angeles 6.

Heavier Thickness Welded By Spot Welding Tongs

50% greater capacity is claimed for a heavier-duty model of the Sureweld portable spot welder. It will efficiently weld up to 3/16-in. combined thickness of mild or stainless steel, says the company, or two pieces of 16 gage galvanized metal.

It operates on a 220 volt, single-phase, 50/60 cycle a-c source and can be used in garages, sheet metal shops and factories. All models have a toggle action lever that locks the tongs on the work during welding. The lever is adjustable for various metal thicknesses. Interchangeable tongs with replaceable tips adapt the welder to a variety of welding conditions.

Weight of the heavy-duty model is 31 lb; standard model weight is 25 lb.

NATIONAL CYLINDER GAS CO., 840 North Michigan Ave., Chicago 11.

* * *

Plastic Cover Lens Forms Air Space

NEW plastic cover lens for welding helmets is claimed to be more durable than regular glass and plastic cover lenses. Its center portion is raised so that an air space is created between it and the filter lens. This reduces fogging to a minimum and does away with the necessity of fiber washers between the two. Other advantages claimed for the new AO cover lens

for welding

Speed that fabricating order with new semi-automatic submerged arc welders or portable spot welders! You may be helped by new fluxes, solders, cable connectors, cranes, torches or corrosion-free steel

are exceptional freeness from pitting, fusion, impact cracks and discoloration.

AMERICAN OPTICAL CO., Southbridge, Mass.

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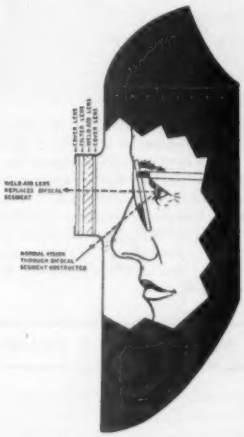

Special Helmet Lens for Bifocal Wearers

SINCE the vision slit of welding helmets is placed for looking straight out, weldors wearing bifocal glasses cannot use the bottom "near-vision" segment of their prescription lens. Thus blurred vision, eyestrain and headaches often work against the weldor who has many years of valuable experience and accumulated sklil to his credit.

To help weldors who wear bifocal prescription glasses, a new "Weld-Aid Lens" can be fitted between the cover and filter lenses. This auxiliary lens is ground to the same prescription as the weldor's lower bifocal segment.

The new lens consists of high-grade optical glass. After being ground, it is mounted securely in a durable plastic frame that fits easily into the average helmet. It should always be placed between the cover and filter lenses to protect it from pitting.

Lenses come in two sizes, 2 by 4⅛ in. and 2 by 4¾ in. and in five powers: 0.75, 1.00, 1.25, 1.50 and 1.75.

WILLSON PRODUCTS, INC., 2nd & Washington Sts., Reading, Pa.

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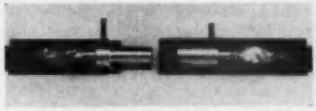

New Cable Connectors Utilize Wedging Action

DOING away with springs, pins and cams, the new "Caddy Quick" welding cable connector maintains contact by a positive wedging action. The connector is joined to the cable by the "Cadweld" process, in which copper oxide and aluminum are reacted inside a graphite crucible to produce a cast copper joint.

Capacity of the 4/0 connector is 500 amp, which means ample protection for smaller cables since the connector fits cables from 1/0 to 4/0. The female end of the connector is completely enclosed by the insulator. Insulators are locked to the connector body by fibre pins. The welder connection can be taped to prevent cable insulation from pulling out of the connector.

ERICO PRODUCTS, INC., 2070 East 61st Place, Cleveland 3.

* * *

New Cast-Iron Flux Cleans Surface Faster

A NEW All-State flux for cast-iron welding and brazing carries the old name of No. 1 "Brazaloy" flux. It is said to clean faster and to impart better flow action than its predecessor. The new No. 1 Brazaloy is claimed to be different compound of more finely ground powders. Its use is recommended with All-State No. 1 cast-iron welding rod and No. 3 cast-iron (copper-coated) welding and brazing rods.

ALL-STATE WELDING ALLOYS CO., INC., 273 Ferris Ave., White Plains, N. Y.

Oxygen in Argon Gas Speeds Inert Arc Welding

NEW and revolutionary principle for multiplying the speed of inert-arc welding of stainless and carbon steels involves the use of small amounts of oxygen in the argon shielding gas. Welding speeds on carbon steels may be doubled as a result of this discovery.

Early Linde research showed that for best welding conditions, metal transfer across the arc consisted of a series of metal droplets propelled at a high velocity. In pure argon, it looks like the bottom picture above.

Droplet rate in the oxygen-argon mixture has been as much as 50 times greater than with pure argon, other conditions being the same (top).

On the other hand, the oxy-argon mixture permits welding at lower current densities, i.e., larger diameter, more economical rods can be used on a given current. If the same size rod is used, thinner metals can be welded. Use of this special mixture is expected to expand the application of inert-arc welding on jobs not practicable with straight argon. The new gas is on the market designated as Linde argon-sigma grade.

THE LINDE AIR PRODUCTS CO., 30 East 42nd St., New York City 17.

Automatic Idler Made For Engine-Driven Welders

A NEW British-made automatic control reduces the engine rpm of engine-driven welders to 500 rpm a few seconds after welding temporarily ceases. The time-delay after welding stops is predetermined and variable, according to the weldor's needs. When the electrode is touched to the work again, the idler is released so that the engine quickly speeds up to working rpm.

The idler is completely self-contained in a hermetically sealed case. It is connected to the engine throttle or air valve by a solenoid control rod that passes through a self-lubricated bearing in the control cover. Two wires from the control must be attached to the welder, though not in series with the welding circuit so no heavy current connections are required.

Operating controls on the idler are a combined on-off switch and rheostat for variable time-delay and an indicator lamp. Switch and rheostat are actuated by a single knob on a graduated scale. A thermostat to cut out the idler is fitted to the engine so that prolonged idling may not unduly cool the cylinder walls to cause excessive wear.

This is the first true idler, claims the manufacturer, Petbow, Ltd., because it reduces engine rpm to 500. Previous such controls only reduced the speed to 1,000 rpm.

For further information, write to PETBOW LTD., Richborough Works, Sandwich, Kent, England.

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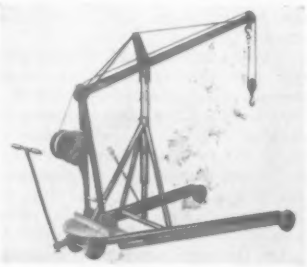

Shop Crane for Weldors Lifts 5,000 Lb.

A hydraulically operated center post that is adjustable increases the lifting height of an improved portable shop crane, the Model 8C. The hydraulic mechanism is said to be easily operated by hand and to give simple and positive control. Boom height adjustments for short-cable lifting jobs take only a few seconds.

Maximum lifting height is 9 ft 8 in. and maximum load capacity is 5,000 lb. Large 8-in. roller-bearing wheels are provided on the frame for moving the load around the shop floor.

ALLIED MFG. & SALES CO., 3101 West Grand Ave., Chicago 22.

* * *

Plastic Safety Goggle Can Be Adjusted

TO fit individual faces, the new "Methaspec Eye-Saver" plastic safety goggle has several adjustable features. The temple length can be changed by simply pushing the temple in or out. Lens angle of the goggles can be changed by holding the lens with one hand and moving temple (at hinge) up or down with the other hand. For added comfort, the bridge of the "Methaspec" is thick on one side and thin on the other and may be reversed so that either side bears on the nose.

Weight of the goggle is only 1¾ oz. It is claimed to have great impact strength and to exceed drop ball and drop needle test strengths set up by federal specifications. It guards against ultra-violet rays also.

WATCHEMOKET OPTICAL CO., INC., Dept. 5N, Providence, R. I.

* * *

Cadmium Free Hard Solder Made for Food Industry

A NEW silver solder that is entirely free of cadmium has been developed for the food processing industry. Short supplies of cadmium, except for high priority defense projects, will not affect the availability of this solder as much as more common mixtures.

Called All-State No. 155, the solder is 55% silver. It has a working temperature of 1,155 F and a very narrow plastic range. Joints made with it are said to have a tensile strength of 50,000 psi. For torch or furnace applications, No. 155 can be used with No. 100 or 200 "Brazaloy" flux.

ALL-STATE WELDING ALLOYS CO., INC., 273 Ferris Ave., White Plains, N. Y.

* * *

Rocker Arm Spot Welders Have Up to 75 KVA Capacity

IMPROVED models of rocker arm spot welders have rugged frames, specially designed transformers, precision electrode arms and controlling valves. Frames are welded ¼-in. boiler plate and angle-iron stiffeners. The head and rocker-arm are cast aluminum, heavily ribbed, in floor models up to 30 kva capacity; from 50 to 75 kva capacity the rocker-arm is cast iron. Either foot or air operation is available in floor models—bench models are foot operated only.

Transformers in these welders are said to have high electrical efficiency due to pancake-coil design and windings of large wire size. The secondary coils are water-cooled and so located as to assist in cooling the primary windings.

Various models are available in the following kva ratings, 10, 15, 20, 30, 50 and 75. Throat lengths vary from 12 to 30 in. and electrode pressure in pounds from 230 to 2,016.

BANNER MFG. CO., 4934 North 29th St., Milwaukee 9.

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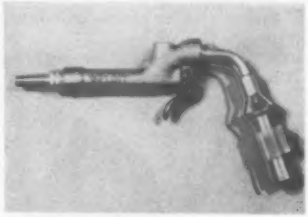

MELTING the adhesive that attaches camera lenses to a grinder spindle, a new gas torch was designed to save time and money for a camera manufacturer. Now available commercially, the torch features the famous "Weldimatic" control and burns either natural or propane gases. Weldit, Inc., 990 Oakman Blvd., Detroit 6.

NEW PRODUCT BRIEFS

Fast healing of X-ray burns and small industrial burns is claimed for "A-Gic," a salve consisting of 80% pure pulp of aloe leaf. Cargille Scientific Inc., 118 Liberty St., New York City 6.

* * *

Red lead shop paint that gives a year's protection to welded steel fabrications dries enough to handle product in four or five hours. Called "Masur-Primer" consists of read lead and alkyd resin. John W. Masury & Son, Inc., 1700 Bayard St., Baltimore 30.

* * *

Pressure-sensitive identification labels and tapes to identify cables, conduits, small pipes, etc. are said to last the life of the product identified. Topflight Tape Co., Div. of Topflight Tool Co., York, Pa.

* * *

New lubricant for tapping armor plate is said to make tools last seven to eight times longer. It contains only fatty oils and pigment having graphite and sulphur compounds. Wayne Chemical Products Co., 9800 Copeland Ave., Detroit 17.

(Continued on page 79)

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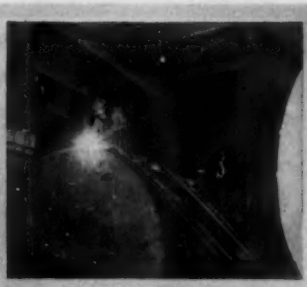

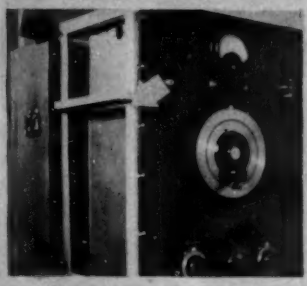

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Suggested Heat Treatment and Forming Data for Boiler and Pressure Vessel Steels

Prepared by the Materials Division, Pressure Vessel Research Committee of the Welding Research Council from an original tabulation by W. P. Gerhart, Bethlehem Steel Co.

ASTM SPEC.		CHEMICAL REQUIREMENTS, PER CENT (1)								TENSILE (2) STRENGTH REQUIREMENT P.S.I.	THICKNESS RANGE(3) INCHES	ANNEALING TREATMENT (4) TEMP °F	COOLING RATE	NORMALIZING TEMP °F (4)	HOT FORMING TEMP RANGE °F (5)
NO.	GRADE	CARBON	MANGANESE	SILICON	NICKEL	CHROMIUM	MOLYBDENUM	COPPER	VANADIUM						
A 30	A	0.25 MAX	0.30-0.80					0.25 MAX		55/85,000	1/8 - 3/4	1800	FURNACE COOL	1700	1750 - 1550
		0.30 MAX	" "					"		" "	3/4 - 2	"	TO 1300°F	"	" "
	B	0.25 MAX	" "					"		48/38,000	1/8 - 3/4	"	@ 20°/HR;	"	" "
		0.30 MAX	" "					"		" "	3/4 - 2	"	AIR COOL	"	" "
A 201	A	0.20 MAX	0.80 MAX	0.15-0.30						55/85,000	1/8 - 1	1800	FURNACE COOL	1700	1750 - 1550
		0.24 MAX	"	" "						" "	1 - 2	"	TO 1300°F	"	" "
		0.27 MAX	"	" "						" "	2 - 4	"	@ 20°/HR;	"	" "
	B	0.24 MAX	"	" "						60/70,000	1/8 - 1	"	AIR COOL	"	" "
		0.27 MAX	"	" "						" "	1 - 2	"		"	" "
		0.30 MAX	"	" "						" "	2 - 4	"		"	" "
A 202	A	0.17 MAX	1.05 - 1.40	0.80-0.90		0.30-0.60				75/90,000	1/8 - 1	1550	FURNACE COOL	1800	1700 - 1500
		"	" "	" "		" "				" "	1 - 2	"	TO 1100°F	"	" "
	B	0.25 MAX	" "	" "		" "				85/100,000	1/8 - 1	"	@ 20°/HR;	"	" "
		"	" "	" "		" "				" "	1 - 2	"	AIR COOL	"	" "
A 203	A	0.17 MAX	0.90 MAX	0.15-0.30	2.00-2.75					65/77,000	1/8 - 1	1475		1800	1850 - 1450
		"	"	" "	" "					" "	1 - 2	"		"	" "
		0.20 MAX	0.90 MAX	" "	" "					" "	2 - 4	"		"	" "
	B	"	0.80 MAX	" "	" "					70/82,000	1/8 - 1	"		"	" "
		"	"	" "	" "					" "	1 - 2	"		"	" "
		0.23 MAX	0.90 MAX	" "	" "					" "	2 - 4	"	FURNACE COOL	"	" "
	C	0.25 MAX	0.80 MAX	" "	" "					75/87,000	1/8 - 1	"	TO 900°F	"	" "
		"	"	" "	" "					" "	1 - 2	"	@ 20°/HR;	"	" "
		0.27 MAX	0.90 MAX	" "	" "					" "	2 - 4	"	AIR COOL	"	" "
	D	0.17 MAX	0.80 MAX	" "	3.25-3.75					65/77,000	1/8 - 1	1425		"	" "
		"	"	" "	" "					" "	1 - 2	"		"	" "
		0.20 MAX	0.90 MAX	" "	" "					" "	2 - 4	"		"	" "
	E	"	0.80 MAX	" "	" "					70/82,000	1/8 - 1	"		"	" "
		"	"	" "	" "					" "	1 - 2	"		"	" "
		0.23 MAX	0.90 MAX	" "	" "					" "	2 - 4	"		"	" "
A 204	A	0.18 MAX	0.90 MAX	0.15-0.30			0.40-0.60			65/77,000	1/8 - 1	1600		1650	1700 - 1550
		0.21 MAX	"	" "			" "			" "	1 - 2	"		"	" "
		0.23 MAX	"	" "			" "			" "	2 - 4	"		"	" "
	B	0.20 MAX	"	" "			" "			70/82,000	1/8 - 1	"	FURNACE COOL	"	" "
		0.23 MAX	"	" "			" "			" "	1 - 2	"	TO 1200°F	"	" "
		0.25 MAX	"	" "			" "			" "	2 - 4	"	@ 20°/HR;	"	" "
	C	0.23 MAX	"	" "			" "			75/87,000	1/8 - 1	"	AIR COOL	"	" "
		0.26 MAX	"	" "			" "			" "	1 - 2	"		"	" "
		0.28 MAX	"	" "			" "			" "	2 - 4	"		"	" "
A 212	A	0.28 MAX	0.90 MAX	0.15-0.30						65/77,000	1/8 - 1	1550		1700	1700 - 1500
		0.31 MAX	"	" "						" "	1 - 2	"	FURNACE COOL	"	" "
		0.33 MAX	"	" "						" "	2 - 4	"	TO 1200°F	"	" "
	B	0.31 MAX	"	" "						70/82,000	1/8 - 1	"	@ 20°/HR;	"	" "
		0.33 MAX	"	" "						" "	1 - 2	"	AIR COOL	"	" "
		0.35 MAX	"	" "						" "	2 - 4	"		"	" "
A 225	A	0.18 MAX	1.45 MAX	0.15-0.30					0.08-0.14	70/82,000	1/8 - 1	1800		1700	1750 - 1550
		"	"	" "					" "	" "	1 - 2	"	FURNACE COOL	"	" "
		"	"	" "					" "	" "	2 - 4	"	TO 1200°F	"	" "
	B	0.20 MAX	"	" "					" "	75/87,000	1/8 - 1	"	@ 20°/HR;	"	" "
		"	"	" "					" "	" "	1 - 2	"	AIR COOL	"	" "
		"	"	" "					" "	" "	2 - 4	"		"	" "
A 285	A	0.15 MAX	0.80 MAX					*0.35 MAX		45/55,000	TO 3/8	1800		1700	1750 - 1550
		0.17 MAX	"					"		" "	3/8 - 2	"	FURNACE COOL	"	" "
	B	0.20 MAX	"					"		50/60,000	TO 3/8	"	TO 1300°F	"	" "
		0.22 MAX	"					"		" "	3/8 - 2	"	@ 20°/HR;	"	" "
	C	0.25 MAX	"					"		55/65,000	TO 3/8	"	AIR COOL	"	" "
		0.30 MAX	"					"		" "	3/8 - 2	"		"	" "
A 299		0.28 MAX	0.90-1.40	0.15-0.30						75/90,000	TO 1	1550	FURNACE COOL	1800	1700 - 1500
		0.31 MAX	" "	" "						" "	1 - 2	"	TO 1200°F @ 20°/HR; AIR COOL	"	" "
A 301		0.21 MAX	0.80 MAX	0.15-0.30		0.50-0.70	0.40-0.60			65/82,000	TO 1	1800	FURNACE COOL	1700	1700 - 1550
		"	"	" "		" "	" "			" "	1 - 2	"	TO 1200°F	"	" "
		"	"	" "		" "	" "			" "	2 - 4	"	@ 20°/HR; AIR COOL	"	" "
A 302	A	0.20 MAX	0.90-1.30	0.15-0.30			0.40-0.60			75/95,000	TO 1	1550		1600	1700 - 1550
		0.23 MAX	" "	" "			" "			" "	1 - 2	"	FURNACE COOL	"	" "
		0.25 MAX	" "	" "			" "			" "	2 - 4	"	TO 1200°F	"	" "
	B	0.20 MAX	1.10-1.50	" "			" "			80/100,000	TO 1	"	@ 20°/HR;	"	" "
		0.23 MAX	" "	" "			" "			" "	1 - 2	"	AIR COOL	"	" "
		0.25 MAX	" "	" "			" "			" "	2 - 4	"		"	" "

Notes

*Only when specified.

(1) Requirements for phosphorus and sulphur, which differ between flange and firebox grades, not included in this table. See individual A.S.T.M. specifications.

(2) Requirements for yield point and elongation not included in this table. See individual A.S.T.M. specifications.

(3) Thicknesses in excess of 4-in. not covered. See individual A.S.T.M. specifications.

(4) Holding times at temperature for annealing and normalizing should be not less than one hour per inch of thickness.

(5) Temperature ranges selected for hot forming are expected to give minimum of grain growth at the maximum of the range and a minimum of distortion at the bottom of the range. Final adjustment to size may be done below the minimum of the range provided the metal shows a red heat and the distortion is not excessive. *Caution:* Refrain from any forming after the metal has reached a black heat — 1000 to 400° F.

A.S.T.M. Specifications and A.S.M.E. Rules permit the following: If the required heat treatment is to be obtained in conjunction with the hot-forming operation, the temperature to which the plates are heated for hot forming shall be equivalent to and shall not significantly exceed the normalizing temperature.

Remarks

Cold Forming: There are no prescribed limits to cold forming operations since composition, heat treatment and amount of hot reduction of the steel, as well as the geometry of the part and its orientation with respect to rolling direction of the plate, are all involved. For shells, cold forming is not generally advisable when the diameter of the shell is less than 5 times the bend-diameter of the bend-test specimen prescribed in the material specification. Plates in excess of 2 in. in thickness should first be normalized when cold forming is necessary. Annealing is also satisfactory, but results in lower plate strength.

Stress-Relieving: Although not mandatory, stress-relieving after hot or cold forming is often desirable, in which case technique may be similar to that specified in Paragraph UW-40, Rules for Construction of Unfired Pressure Vessels, Section VIII, A.S.M.E. Boiler Code (1950 Edition). Temperature should be a minimum of 1100° F. for one hour per inch of metal thickness. It is sometimes convenient to delay stress-relieving of hot formed vessels until after welding.

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A Welding Engineer Reader Service

1 FLUX CRUSHER—Robert Holmes & Bros., Danville, Ill. 8-page bulletin pictures and describes a sample crusher that quickly and efficiently crushes used flux from automatic welding operations so that it may be reclaimed. Power requirements, capacities and sizes are discussed.

2 CUTTING MACHINE—Air Reduction Sales Co., New York City 17. Literature tells about the Airco No. 41 "Radiagraph" straight-track guided apparatus for the heaviest types of flame-cutting, welding and flame-hardening operations. Inert-arc, edge-preparation, and flame hardening attachments that can be used with it are discussed. See page 79.

3 BIFOCAL WELDOR'S LENS — Willson Products Inc., Reading, Pa. Literature tells about a new lens for welding helmets that is ground to the same prescription as lower "near-vision" segment of bifocal glasses. See page 45.

4 WELDING STAINLESS — The McKay Co., Pittsburgh 22. 48-page pocket-size handbook describes every phase of stainless arc welding. It gives metallurgical data, specific uses of alloy elements, AISI analysis, color guide and tensile strengths. Electrode choice and application procedures are also covered.

5 PLASTIC SAFETY GOGGLE — Watchemokst Optical Co., Inc., Providence, R. I. Literature tells about the "Methaspec" plastic goggle with adjustable temples, lens angle and bridge. Ultra-violet shielding action is also explained. See page 46.

6 CABLE CONNECTOR — Erico Products Inc., Cleveland 3. Bulletin gives clear illustration of wedge-locking action of new "Caddy Quick" welding cable connector. Construction of the connector is described and explained and directions are given for attaching them to the cable by the "Cadweld" process. See page 46.

7 SEMI-AUTOMATIC WELDER — The Linde Air Products Co., New York City 17. Literature describes the UMW-1 semi-automatic welder for making submerged-arc weld joints by hand. Equipment and operating characteristics are shown as well as illustrations. See page 44.

8 CHECK R-W SCHEDULES — The Brush Development Co., Cleveland 14. 8-page bulletin written by J. J. Riley of Taylor-Winfield Corp., tells about the measurement of welding schedule variables on resistance welders with Brush recording instruments. Eight figures show sample recordings and the test set-ups.

9 FAST HARD-FACING ROD—Rankin Mfg. Co., Los Angeles 6. Single-sheet bulletin B-X gives physical characteristics and operating data of new "Ranite B-X" hard-facing electrodes, said to deposit 25% faster. Such subjects as dilution and hardness are covered. See page 44.

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10 FLAME HARDENING—Air Reduction Sales Co., New York City 17. 6-page article written by Airco's J. J. Barry tells about the historical development of flame hardening and brings it up to modern day methods and equipment. There are 17 photos and sketches to illustrate principles discussed.

11 SPOT WELDING CATALOG — Acro Welder Mfg. Co., Milwaukee 3. 4-page catalog X-101 pictures 15 different resistance welders including spot, rocker arm, seam, flash, portable gun and special welders. Ratings, dimensions and electrode pressures are given for most models.

12 ALUMINUM - BRONZE ELECTRODES—Ampco Metal, Inc., Milwaukee 15. 4-page reprint of an article from the *Welding Journal*, tells about using aluminum-bronze electrodes to repair and rebuild pump shafts, gears, pinions, idlers and tracks. There are 12 pictures and tables that illustrate the clear discussion, written by Joseph A. Cunningham, of Philadelphia.

13 WELDED STEEL STRUCTURES —The Lincoln Electric Co., Cleveland 1. 10-page reprint surveys past and present practice in welded structures, as well as current research. Other subjects discussed by the author, Arsham Amerikian, of the Bureau of Yards and Docks, U. S. Navy, are fabrication practice, prefabrication and modern framing.

14 ROCKER ARM WELDERS—Banner Mfg. Co., Milwaukee 9. 4-page, two color bulletin SR49-1 gives a fast review of the new Banner rocker arm spot welders rated up to 75 kva. Data on construction, transformer, throat and arms, foot or air operation and applications are listed as well as explained.

15 AIRCRAFT SPOT WELDING — Sciaky Bros., Chicago 38. 4-page bulletin tells about spot welding of jet aircraft components with the Sciaky PMCO 2ST welder. A table compares riveting with spotwelding time on a control surface skin.

16 X-RAY ACCESSORIES — Picker X-Ray Corp., New York City 10. 8-page bulletin 21250 pictures and describes equipment and accessories for industrial radiography. The catalog describes X-ray machines, film processing outfits, films, fluoroscopes, cutters, lead-alloy screens and penetrameters.

17 WELDING FITTINGS — Tube Turns, Inc., Louisville 1, Ky. Single page, colored reprint shows use of Tube Turn welding fittings in a big downspout installation on a Cleveland bridge. Advantages in erection and safety are discussed.

18 STAINLESS TUBING — The Babcock & Wilcox Tube Co., Beaver Falls, Pa. 4-page bulletin TB-19 is a condensed technical data sheet on B&W seamless and welded stainless tubes and pipe. Chemical analysis, mechanical, electrical and physical properties, oxidation resistance and thermal treatment for ten AISI 300 and 400 steels.

19 CONNECTOR CATALOG — Twece Products Co., Wichita 1, Kans. 12-page "Twecolog" No. 8 pictures and describes the complete line of Twece electrode holders, cable connectors, splicers, ground clamps and lugs. All parts are completely designated by specifications and prices.

20 SALT BATH BRAZING — Ajax Electric Co., Inc., Philadelphia 23. 4-page bulletin 124 gives a simple explanation of salt bath brazing for joining bicycle assemblies, pinion shafts, carbide-tipped tools, starters, heat exchangers and other metal assemblies. Equipment and other considerations are also discussed.

21 FIRE-BRICK — Johns-Manville, 20 East 40th St., New York 16. 4-page bulletin tells about JM-3000 insulating fire brick for weldor's tables, forging furnaces, pre-heating set-ups, etc. Other types of fire brick are listed and their properties described.

22 PUMP-REPAIR ELECTRODES — Worthington Pump and Machinery Corp., Harrison, N. J. 6-page folder W-350-B5C tells about "Worthite" welding electrodes made from a special alloy of metal used in Worthington pump construction. This metal is claimed to have corrosion-resistance equal or superior to stainless.

23 ALL- PURPOSE WELDER—Precision Welder Mfg. Co., Chicago 10. Single sheet bulletin and specification sheet tells about the Model 20A all purpose welder for the small shop or the occasional weldor. The specification sheet lists other Precision welders with capacities, power requirements and ratings.

24 SILVER BRAZING STRIP—Goldsmith Bros. Smelting and Refining Co., Chicago 36. Price list No. 206 tells about sizes, amounts and prices of silver brazing wire and strips in 2 to 6-in. widths.

25 METALLIZING—Metallizing Company of America, Chicago 24. New 20-page bulletin gives a complete picture of maintenance by metallizing, the equipment needed, the various types of metals sprayed, operating specifications, comparative costs.

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We Must Pay As We Go

***We** must do our utmost to pay as we go for our present defense program.*

On that proposition those who speak with authority are remarkably well agreed. This editorial – the second in a series on our mobilization for freedom – sets forth in simple terms why there is this agreement.

Next year – the fiscal year beginning next July 1 – the federal government's budget calls for the expenditure of $10 billion more than is scheduled to be collected in taxes. The deficit is due to the increase in defense expenditures.

A part of this deficit can be eliminated by cutting non-essential expenditures and increasing efficiency in the defense program. There is wide agreement on this. It is the duty of the President and Congress to see that it is saved.

How the remaining deficit anticipated in the federal budget—$5 billion to $10 billion—is handled is crucial. The government can meet it by raising taxes—by paying as we go. Or it can borrow, issuing more government bonds.

Borrow Again?

We relied heavily on borrowing in both World War I and World War II. In World War I only about one-third of the expenditures of the federal government were met by taxation. In World War II about 45 percent were met in this way. The rest we borrowed. Some people ask, why can't we rely heavily on borrowing again? Why is it crucially important to avoid adding $5 billion to $10 billion to a federal debt that is already $257 billion?

Part of the answer is found in the contrast between this defense program and our all-out effort of World War II. Another part—and one that is all-important in combatting inflation—results from the rapid decline in the purchasing power of the American dollar in recent years.

We went "all out" in World War II. We put almost half of everything we produced into our military effort. Taxes high enough to pay the financial costs as incurred would have meant huge tax increases. It was feared that such increases would kill financial incentives to get "all out" production. Since we expected the war to be short, borrowing seemed a safe expedient. Price control and rationing, with wartime patriotism to give them effective support, were relied upon to keep in check the inflationary pressure created by borrowing rather than taxing.

Our present defense program is scheduled to take a much smaller share of our production, but to take it over a much longer period. At its peak, the program as now planned will take only about 20 percent of our total national production. But, to use General Bradley's phrase, "the conditions under which we labor may persist for ten, fifteen and twenty years."

What About Controls?

For a period of any such duration it would be foolhardy to expect that the sort of controls we had for the few years of World War II could hold in check the inflationary pressure created by not paying as we go. It would be as foolhardy as it would be for a family to plan on borrowing to pay the expenses of a member discovered to be afflicted by a chronic ailment which might last a long lifetime.

Obviously, the only safe thing to do in such a case would be to adjust the family budget so that the expenses of the illness would be paid currently.

Our heavy reliance on borrowing in World War II had consequences which block a successful repeat performance.

If the borrowing had been done by persuading individuals to transfer their savings into government bonds, relatively little inflationary pressure would have been created. What the government would have spent with the proceeds of such bond sales would have been subtracted from the money individual consumers could spend.

But most of the borrowing was done from banks. That course expanded the amount of money available to the government without any offsetting subtraction of money from the hands of individuals. Thus, when direct price controls were removed after the war, this bottled-up purchasing power contributed to a price inflation which has cut purchasing power of the American dollar about in half – and decidedly changed the attitudes of the American people toward that dollar.

During World War II, Americans in general believed that:

The war would not last long.

The dollar would hold its value, and even gain value after the war.

Many wonderful new products would be available in the postwar period.

Today the American people have:

Seen the value of their dollars melt away fast.

Been assured that, at best, we may have a 10-15-20-year pull ahead.

Been warned not to expect a postwar paradise anytime soon.

One result of these changed attitudes is a notable lack of enthusiasm for government bonds on the part of individual investors. This is indicated by the fact that since Korea redemptions of E bonds have exceeded sales by about $600 million. Another result is a continuing rush to convert dollars into physical goods and equipment or claims on them. This trend weighs against financing the prospective federal deficit by borrowing from individuals.

Borrowing from banks to meet the deficit would again add fuel to inflation.

The prospective deficit is due to federal expenditures for military goods. Even if they are not blown up or shipped abroad, these goods will not be available to civilians. But the money paid to those who produce military goods will still be available to bid up the prices of civilian goods. Thus, at a time when people show relatively little disposition to save dollars, a menacing inflationary pressure – an inflationary gap, the economists call it – will be created.

If our fight against inflation is to be successful this gap must be closed by taxes. We need to do other things, too, for inflation has many different causes. Credit expansion must be effectively controlled. Production of civilian goods must be increased as much as possible by eliminating waste and inefficiency. But a pay-as-we-go tax program is basic to a successful attack on inflation. And inflation – unless it is checked – could wreck our defense effort.

We cannot pay as we go merely by soaking harder the corporations and those in the upper income brackets.

As the President's Council of Economic Advisers has reported, "by far the largest part of the additional revenue must come from the middle and lower tax brackets. These are the brackets in which the great bulk of the income is located."

Taxes Can Attack Inflation

By spreading tax increases broadly, taking small amounts from many people, inflationary pressure would be effectively reduced. It is the expenditures of the great mass of people, rather than the small numbers in the upper income tax brackets, that create most of the pressure. Moreover, it is possible to increase taxes broadly without killing the economic incentives to produce. Maintaining these incentives is essential to the success of the defense effort.

Our elected representatives cannot be expected to be enthusiastic about a pay-as-we-go tax program. It involves increasing the taxes of the great body of their constituents, an operation completely lacking in political glamour. However, such a program also involves the integrity of the American dollar. And that is absolutely essential to the success of the defense program. We shall be very foolish if we do not let our leaders know that we want them to do everything possible to pay as we go.

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...SILVALOY #355 helped to solve this complex brazing problem with outstanding success!

The component parts of this excellent Casco monel and stainless steel iron are furnace-brazed at a highly satisfactory rate of production. In assembly line, the joint areas are properly fluxed and Silvaloy #355 Brazing Alloy Preforms are positioned to join the various units. The assembly is then secured in a stainless steel fixture and placed in an atmospheric controlled Rockwell conveyor type furnace.

The Silvaloy joints produced are clean, strong and leakproof. Life tests for corrosion have been made and all reports assure prolonged, trouble-free service.

Silvaloy #355 is the only silver brazing alloy with properties and characteristics required for this operation. It has enabled this manufacturer to maintain a profitable rate of production and reduce drastically the percentage of rejects to an extremely low figure.

There is a Silvaloy silver brazing alloy for every type of brazing operation—in wire, strip, rings and preformed shapes. A staff of Silvaloy technical experts is also available for consultation. Take advantage of this useful service. Your inquiry will be given immediate attention. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

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on the job

Courtesy Federal Telephone and Radio Corp.

JUST BOXES of aluminum—but they involved a big production problem when welded in large quantities

Courtesy A. M. Byers Co.

16 MILES of wrought-iron pipe had to be gas welded for the freezing system of the Wollman Memorial Rink

Titanium Tested for Aircraft

PROVIDED service temperatures above 600 F are not encountered, titanium and titanium alloys can replace stainless steel in airplanes with a 43% weight saving and added resistance to corrosion. Strength of titanium is comparable to that of stainless steel. Similar weight savings could be accomplished by the replacement of alloy steels with titanium-alloy forgings, bars or plates.

These conclusions were reached by the Boeing Airplane Co., Seattle, Wash., after conducting experimental forming, machining and welding tests with titanium in several forms, mostly of the commercially pure grade.

Boeing found that titanium could be successfully welded to titanium by spot welding, seam welding and inert-arc welding. The welding of titanium to other metals was not successful, nor was the brazing of titanium. This is probably because of titanium's higher melting temperature as compared to other metals and alloys (3,270 F as compared to 2,300 F for cast iron, 1,981 F for copper, 1,220 F for aluminum and 1,204 for magnesium).

An exceptionally tenacious oxide coating forms on the surface of titanium. This oxide must be removed before titanium can be successfully brazed, Boeing discovered. At present there is no method of doing this on a production basis; however, a similar problem had to be solved with regard to aluminum.

Boeing found that drilling, tapping, reaming, turning, milling and thread chasing could be done on titanium bars. Sheet was satisfactorily formed by power brake, by drop-hammer, by spinning and by hydraulic press, the latter operation being more successful at temperatures of 450 to 750 F. Rivets could also be formed from titanium wire.

* * *

Simple but Tough

(See left picture)

RECTANGULAR aluminum boxes are used by the Signal Corps and other branches of the armed services to enclose various types of communications equipment. There are three different styles, ranging in size from 3 by 6 by 12 in. to 5 by 5 by 14 in.

The apparent simplicity of this weldment is no clue to the toughness of the manufacturing problems it involved. The aluminum box project was called a "major challenge to manufacturing ingenuity," by Edward K. Smith, one of the men who finally found a way by which it could be done. Mr. Smith, who is general foreman of the sheet-metal department of the Federal Telephone and Radio Corp., Clifton, N. J., worked out a successful welding method with the aid of Thomas Engel and Charles Wanamaker, of Linde Air Products.

One of the difficulties was to eliminate warpage due to heat distortion, which was causing too high a percentage of rejects in early production tests. An even harder problem was to weld the corners without burning through the aluminum. This difficulty was caused by the slow-down in the travel of the welding head as it rounded the sharp corners of the box.

Mr. Smith and his collaborators recommended use of the inert-arc welding process with argon shielding gas and a tungsten electrode. The inert-arc torch was mounted on the carriage of a standard shape-cutting machine. Precision jigs to hold the work completed the set-up.

* * *

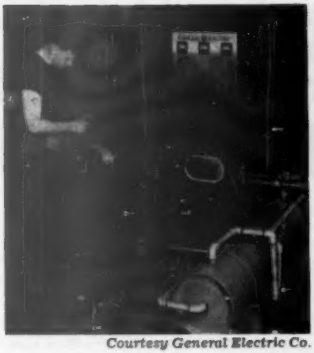
Good News for Skaters

(See right picture)

NEW YORKERS, who like to do things in a big way, now have the largest artificial skating rink in the world. It will hold 1,000 skaters and provide a full winter of ice skating, from November 1 to March 31. On naturally frozen surfaces, the average winter allows only 10 to 12 days of skating. In summer, the rink, will be "defrosted" for roller skating.

Located in Central Park, the new rink was made possible by a grant of $600,000 from Miss Kate Wollman, given in memory of her parents and brothers. It was built under the supervision of the city's Department of Parks, Robert Moses, commissioner.

The rink's freezing system comprises 16 miles of 1¼-in. wrought-iron pipe. The lengths of extra-heavy wrought-iron pipe were gas welded together and bent on 4-in. centers. The network of pipe was then embedded in an expanse of concrete covering almost three quarters of an acre.



Courtesy General Electric Co.

TIP ENDS of automotive valves are hardened by induction heater

Induction-Hardened Valves

THOMPSON PRODUCTS, INC., Cleveland, uses a 20-kw induction heater to harden the tip ends of valves for automobile and aircraft engines. Costs were cut 30% over the former hardening method. The induction heater processes over 35,000 valves per day, operating 24 hours a day during a five-day week.

Previously, Thompson had used flame-hardening. The valves were set in water with tips protruding just above the water line. They were indexed in line for heat treating with oxyacetylene torches by means of an automatic chain conveyor belt. Though this system worked fairly well, it was not suited to large-volume production.

Organized in 1901, Thompson Products, Inc., produces valves for practically every American automobile manufacturer. The company also makes sodium-filled aircraft valves.

* * *

Courtesy Linde Air Products

INSIDE JOB! Weldor makes an inside seam on stainless-steel milk tank 18-ft high. The 2,750-gallon container was fabricated by American Boiler Works, Everett, Wash.

PAGE *Stainless Steel*

WELDING ELECTRODES

Armor Welding Electrodes

. . . and All Standard Types

AC or DC . . . the BEST

. . . for any weld

on all types

of stainless steel

STAINLESS STEEL has great strength . . . but its strength is limited by the quality of welds which seal the joints. In all kinds of manufacturing—military work in particular—stainless is being used more widely. If you weld stainless, choose electrodes with care.

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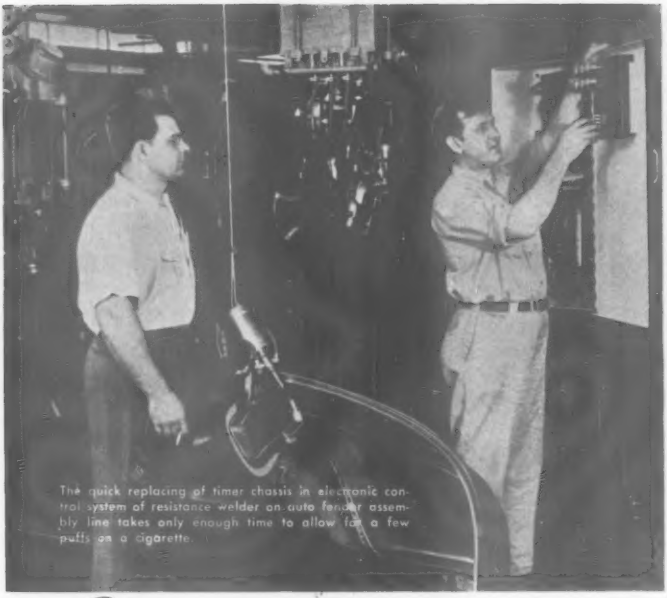
The quick replacing of timer chassis in electronic control system of resistance welder on auto fender assembly line takes only enough time to allow for a few puffs on a cigarette.

Robotron INTERCHANGEABLE CONTROL PANELS CUT PRODUCTION DOWN-TIME . . .

With civilian and defense production demands at an all-time high, the reducing of unnecessary production line down-time is most vital. This is particularly true when considering the use of resistance welding controls, since not all controls are designed with the maintenance men's problems in mind. Whether converting welding equipment from spot welding to a pulsation sequence, or just replacing a faulty unit — easy, quick replacement is an important consideration.

Robotron electronic control systems with popular interchangeable timer panels have many features production and maintenance men like. They weld faster to closer tolerances, with less rejects and breakdowns. Simply and sturdily constructed, they provide maximum accessibility to all parts without disconnecting any external circuit wiring. The Robotron control panel, Ignitron assembly and relays are all easily and quickly removed or installed by anyone. Considering production *and* maintenance, Robotron leads the field for long, trouble-free use.

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GUARDING EYES WITH PLASTICS

(Continued from page 39)

larger than in the usual industrial goggle. Various types of side and top shields ward off particles coming from any direction. At the same time the transparent plastic permits unobstructed light transmission.

These plastic goggles have the further advantages of being light in weight and of being adaptable in the larger sizes to use as cover goggles. When so worn, this outer plastic goggle protects ordinary corrective spectacles as well as the eyes from flying particles.

Plastic side shields for various types of industrial goggles are recommended for many occupations where small flying particles are involved as in grinding or chipping welds. These shields may also be tinted to reduce possible side glare.

One of the most successful uses of plastics for eye protection has been in the manufacture of face shields. These are used where protection is needed for the whole face, where atmospheric conditions cause goggles to become fogged or if a face shield is more acceptable to an employee. Face shields are made in a variety of lengths for different degrees of protection. When the adoption of curved face shields is contemplated, however, they should be critically examined for possible distortion.

How Plastics Compare with Glass

As both research and practical applications have shown, each kind of plastic has its own area of use and its own limitations. As a group, plastics can hold their own with glass against impact hazards at ordinary temperatures but are less successful at low temperatures. In two cases, plastics are better against impact at high temperatures; they also have a definite superiority as far as molten metal splash, high-velocity impact and some chemicals are concerned. Plastics are inferior to glass in respect to abrasion, and they should be avoided whenever there is a possibility of injurious light radiation.

Most of the plastics that are used for optical purposes belong to the thermoplastic group. Thermoplastic materials soften whenever they are reheated and harden again into shape

DOUBLES LIFE OF MIXER PARTS

...tough base metal withstands SHOCK
...hard-faced surfaces resist ABRASION and CORROSION

Here is another example of how hard-facing eliminates the need for a compromise when both hardness and toughness are needed for a particular part. This rotor and stator for a homogenizing machine are made from a tough base metal—Type 303 stainless steel. The bearing surfaces of the two parts are hard-faced with HAYNES STELLITE cobalt-base alloy. The parts are tough enough to stand up under the shock of pulverizing operations at high speeds ... and yet the working surfaces are hard enough to resist the abrasive and corrosive effects of the materials being mixed.

For two years, no machine equipped with hard-faced parts has been returned or serviced because of rotor or stator failure. The heat-treated parts formerly used on these machines failed after only a year's service. The heat-treatment affected the corrosion resistance of the metal and also made the blades on the rotor too brittle.

For the whole story on hard-facing, including detailed procedures for applying various HAYNES alloys to wearing surfaces, write for the new 40-page booklet, "HAYNES Alloys—Hard-Facing Manual."

Hard-faced rotor, before finishing.

Hard-faced stator, before finishing.

Hard-facing doubles the life of these mixing-machine parts. In operation, they run with very close clearance at speeds of at least 3600 revolutions per minute. The clearance between the hard-faced bearing surfaces is filled in with the abrasive mixture.

HAYNES alloys

TRADE-MARK

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

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A Division of
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General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

Rotate Tip in any direction *even while flame is burning!*

PLUS THESE EXTRA ADVANTAGES

CHANGE TIPS IN 6 SECONDS

No wrench needed. Fingers do the job. Just insert new tip—spin nut down—that's all.

GUARANTEED service for the rest of your life on all Smith's "LIFELONG" welding torch bodies and cutting assemblies.

THINK what this means in speeding up production schedules and reducing operator fatigue! The average welder is on a stop-and-go basis most of the day—shifting to new positions or stopping to adjust his work—and thus losing production time.

This new Smith Equipment makes it possible to work in the most comfortable and convenient position because the tip can be turned in any direction even while flame is burning. No time out to shut off flame, adjust tip angle or move your work. Just a twist of the finger, or a tap on the side of the tip does the job. It's a time-saver to help you increase production per man-hour and meet production schedules.

NOTE: This feature plus high speed change of tips (in 6 seconds—no wrench needed) is available in the following Smith equipment: Smith's "LIFELONG," MIDLINE and AIRLINE Torches.

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SMITH WELDING EQUIPMENT CORPORATION

Manufacturers of fine Welding Equipment for over 40 Years

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Please send me more information on the time-saving and money-saving features of your new torch.

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upon cooling. They thus differ markedly from that other great group of plastics—the thermosetting group—which hardens into permanent shape after subjection to heat and pressure and does not soften under a reheat.

Until fairly recently, thermoplastics were unsuited to applications in which they were exposed to temperatures of 160 F or higher. That drastically limited their use. New developments, however, have introduced thermoplastics that are less susceptible to softening at higher temperatures.

The plastics with properties most suitable for eye protection are: vinyl resins, allyl casting resin, cellulose acetate and methyl methacrylate. The vinyl resins are among the more recent compounds to attain commercial importance in this country. They are derived mainly from acetylene (which is reacted with acetic acid or hydrogen chloride), and they appear in a wide range of rigid and elastic forms.

Numerous types and applications of plastic "eye savers" have been devised and produced with a view to safety and comfort of the welding operator. It is being recognized that unless goggles are comfortable the welding shop foreman is going to have a hard time making sure that they are in constant use every working hour on every worker.

The importance of light weight, transparency and ability to be used for frame as well as lens construction should not be overlooked in assigning to plastics the rightful place they deserve in the field of eye protection.

Study the Problem

To summarize, each safety supervisor or foreman should follow this procedure:

1. Analyze the eye hazards of the job and the needs of the workers.

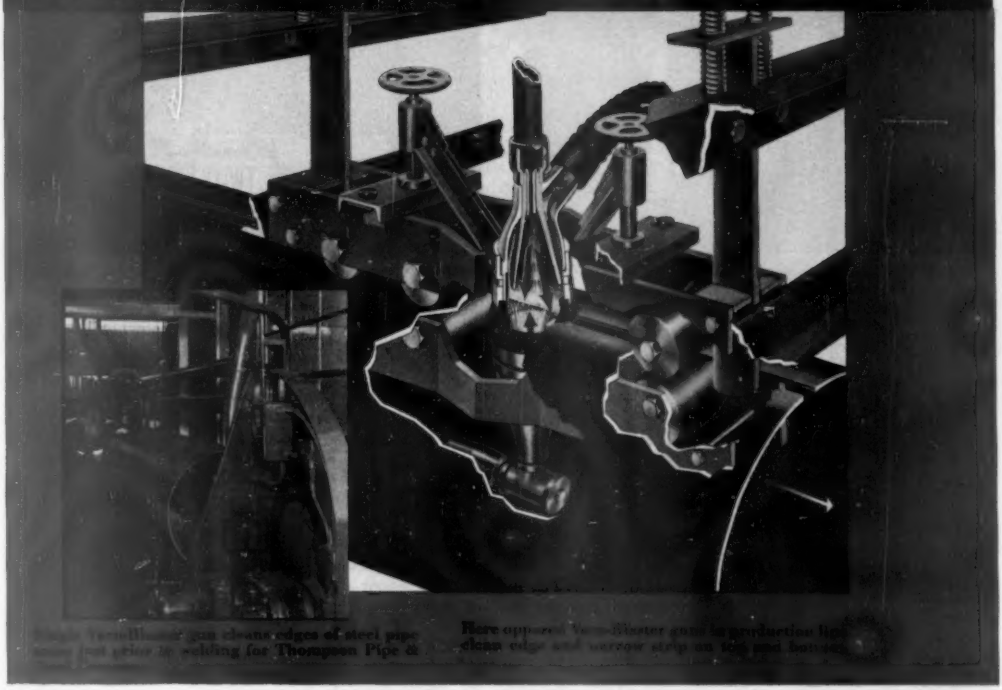
2. Select the most modern, improved eye savers available for maximum safety at each job.

3. Choose a comfortable, good-looking goggle that workers will wear.

The cost of eye disablements as reflected in workmen's compensation alone, is about $50,000,000 per year over all industry. To this must be added loss through inefficiency after injury or loss of sight.

You can see that inadequate eye protection costs plenty!

REVOLUTIONARY NEW WAY TO EDGE-CLEAN SHEETS FOR WELDING!



Thompson Pipe & Steel Co. formerly edge-cleaned steel sheets in a blast room some distance from the welding—cleaned plates often became rusty before reaching the welder. Consumption of abrasives was very high. They reported: "Installation of Vacu-Blaster has allowed us to blast the edges of plates just prior to welding, and this is done with no discomfort to welders or other workers nearby. Steel grit consumption has been reduced considerably."

Revolutionary Vacu-Blaster is the only blast-cleaner with a vacuum pick-up. It reclaims and re-uses abrasive, eliminates flying dust and dirt, does away with clean-up time, actually pays for itself!

Vacu-Blaster can be precisely controlled to clean narrow strip on top and bottom edges of steel plate or to clean whole surfaces of metal, concrete, wood or brick. It's portable—can be moved to any job—or installed right in your production line. Ideal for pipe, tank, drum or pail manufacturing. (One company reports savings of $1000 a month after installing Vacu-Blaster!)

Hundreds of satisfied users. Mail coupon for details about patented Vacu-Blaster, the only blast-cleaner with a vacuum pick-up.

DEMONSTRATION CAN BE ARRANGED!

VACU-BLAST CO. Inc.

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Write for FREE BOOKLET!

Vacu-Blast Co., Inc., 692 Peninsular Ave., San Mateo, Calif.
We would like your free Vacu-Blaster catalogue_____ Wish to arrange for demonstration_____ Our problem is_____

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Company_____

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2259

KEYNOTE display for Indiana Oxygen Company 3-day conference included large book of company services. Visitors heard a new show idea—recorded sales talks

STANDING by Tweco booth at conference are Indiana Oxygen's H. K. Schuck and Jack L. Rich, sales; R. D. Myers, welding engineer and J. R. Brant, sales manager

NEWS

International Welding Congress Meets at London, July 14-21

THE general assembly of the International Institute of Welding will be held in Great Britain this year during Festival of Britain activities. Reception of delegates from foreign countries and from the United Kingdom will be held in London on Saturday, July 14.

The governing council meetings as well as those of the thirteen technical commissions will take place at Oxford, July 16-18. Three special open sessions will offer discussions of welded bridges and structures, welding of wrought alloys and current trends in British welding.

From July 21 to 28, the overseas delegates of the conference will be the guests of branches of the British Institute of Welding in all industrial centers of Great Britain.

Some 400 overseas delegates are expected to attend the congress as well as numerous welding men from the U.K.

—McGraw-Hill World News

* * *

Welding Profit Calculator Available for Distributors

PRINTED on heavy cardboard, special profit tables for welding distributors can be purchased from the National Welding Supply Association. One table shows how to figure a selling cost that reflects an adequate mark-up after costs. Another suggests how to arrive at net profits. The third shows how to find the selling price of an article based on the percent of profit desired and the cost of doing business.

The folders are available at cost as follows: 15 copies for $1, 25 copies for $1.50, 50 copies for $2.50 and 100 copies for $5. NWSA members can obtain quantities of less than 15 without charge from national headquarters at 1900 Arch St., Philadelphia 3.

* * *

Big Welding Display At London Aug. 30-Sept. 13

WELDING equipment from every country in the world except those behind the Soviet-dominated borders will be on view at the Engineering, Marine and Welding Exhibition, to be held in London from Aug. 30 to Sept. 13. It is expected that many foreign visitors in the United Kingdom for the Festival of Britain will be attracted to the show. Value of the engineering displays at the 1949 show (the exhibition is held biennially) was estimated at 808 million pounds.

* * *

Weld Nine Freight Cars Together to Carry Cable

A SEVEN-MILE long submarine cable, longest ever manufactured in one section, was recently transported across country in nine freight cars that were locked together by double sets of welded chain couplings.

Approximately 4,400 ft of cable were coiled in each car and carried in a vertical loop to the next car. Naturally, any separation between cars would put a damaging strain on this loop.

The shipment weighed about 800,000 lb. The cable will be installed in Puget Sound to carry electric power to the San Juan island group from the Bonneville power project in Washington. It was made by the Okonite-Callendar Cable Co., Paterson, N. J.

* * *

Indiana Oxygen Holds 3-Day Welding Conference

MORE than 700 visitors attended the recent three-day welding conference sponsored by the Indiana Oxygen Co. and staged in the educational building at the State Fair Grounds in Indianapolis. The conference was marked by the use of "on-the-spot" recorded sales stories, purpose of which was to give every visitor a chance to hear the full story of a product as well as see it in demonstration. The recorded talks were played back to the audience at intervals throughout the three days.

Supplementing the new sales method were the tried and proven individual display booths of 15 major suppliers. Demonstration movies were also shown on welding safety, good grinding methods, new welding processes and unusual applications of welding.

Indiana Oxygen says that the conference was the most successful in its 36-year history.

Here's why you should

GET IN THE SCRAP

★

Production of the new steel you'll need tomorrow depends on the iron and steel scrap that goes back to the steel mills today. For more than 90 per cent of all U. S. steel is made in open-hearth furnaces from a mixture of pig iron and scrap. To keep going takes over *50 million tons* of scrap a year!

By using iron and steel scrap in this way, steelmakers can produce more new steel—*and do it more quickly*—with existing facilities. Quality of the steel is improved, too.

And raw materials—it takes almost four tons to make one of pig iron—are conserved. Every ton of scrap returned to the mills saves a ton of pig iron, *plus the time to make it*.

Steel mills themselves can furnish only two-thirds of the scrap they need. The rest must come from you. Your idle scrap keeps steel in short supply, hampers the National Defense effort, and costs you money. So sell it, ship it—keep it moving.

Here's what you can do to help get much-needed scrap to Steel Mills

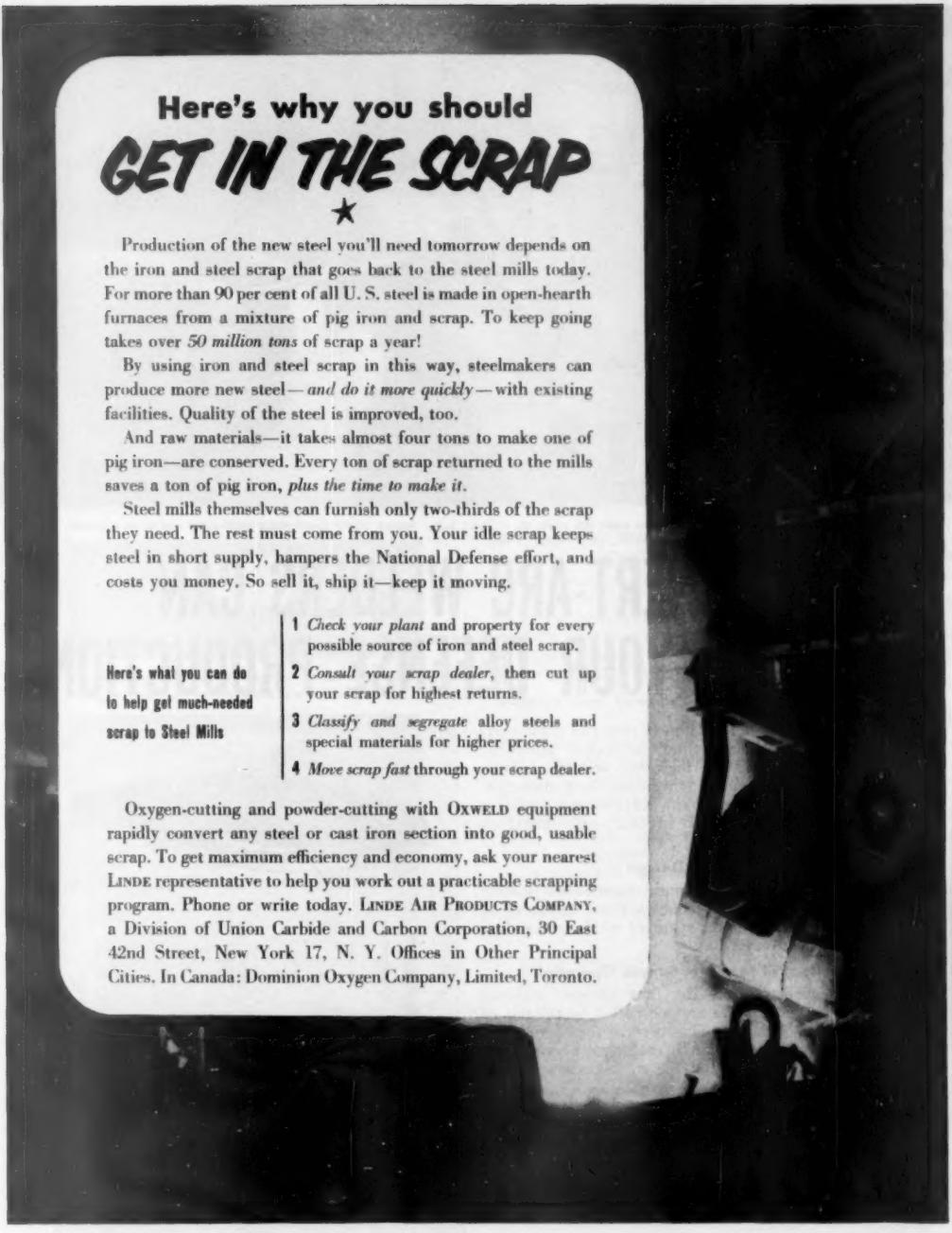
1 *Check your plant* and property for every possible source of iron and steel scrap.

2 *Consult your scrap dealer*, then cut up your scrap for highest returns.

3 *Classify and segregate* alloy steels and special materials for higher prices.

4 *Move scrap fast* through your scrap dealer.

Oxygen-cutting and powder-cutting with OXWELD equipment rapidly convert any steel or cast iron section into good, usable scrap. To get maximum efficiency and economy, ask your nearest LINDE representative to help you work out a practicable scrapping program. Phone or write today. LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in Other Principal Cities. In Canada: Dominion Oxygen Company, Limited, Toronto.



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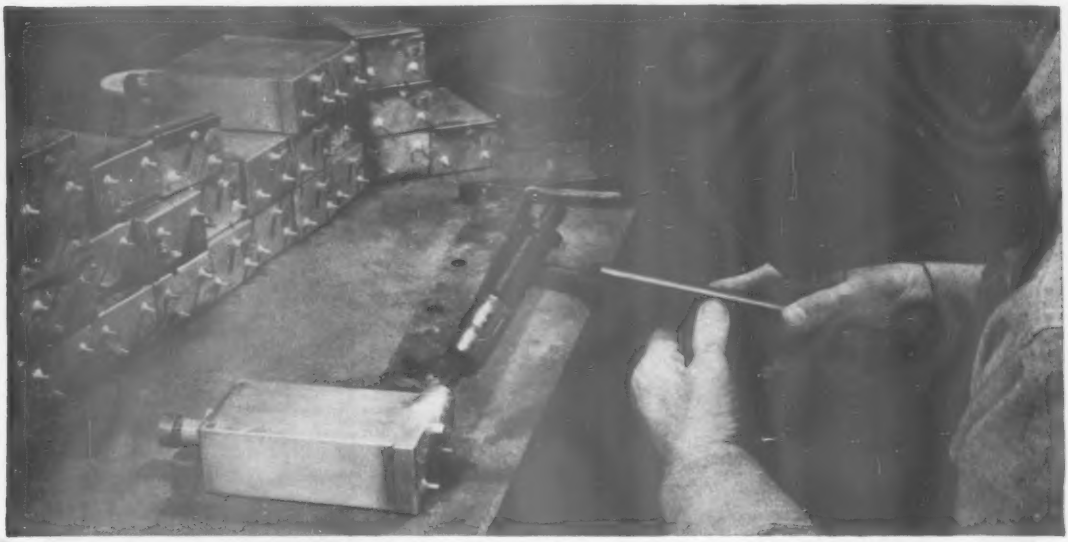


Here, G-E Inert-Arc welding is used to weld the seam on a "buzz box," source of the spark which ignites the fuel in jet engines.

WHY G-E INERT-ARC WELDERS CAN SPEED UP YOUR DEFENSE PRODUCTION

You can speed up the fabrication of ship and plane parts made of aluminum, magnesium, or copper alloys by using General Electric a-c Inert-Arc welders because they are specially designed for welding these materials. They give your operators many features not found in "jury-rig" modifications of ordinary a-c metal-arc welders.

Exclusive "Balanced Wave" Design

Balanced-wave design, for example, an exclusive feature of G-E Inert-Arc welders, enables your operators to increase travel speeds, make stronger welds, and reduce power and gas consumption.

"Idlematic" Control for Safe, Simple Operation

The high-frequency pilot, the flow of gas, welding current, and cooling water are controlled by the use of G-E "Idlematic" control. This permits the operator to save time and reduce spoilage by making it easy to start the arc at the proper spot on the work because he can position the electrode with his hood up.

Crater-filler or Remote Control

On applications requiring weld craters to be level at the end of each weld bead, use of the optional G-E crater-filler will enable you to do the job quickly. Where desired, a hand or foot switch can be furnished to allow continuous stepless current control while welding.

Write for Free Bulletin

For detailed information on how you can speed up fabrication of aluminum and other alloys, write for bulletins GEC-596 and GEC-653. *General Electric Company, Schenectady, N. Y.*

G-E Inert-Arc welders are easy to use. Simply touch the electrode to the work and you're off to a quick clean start—and without using flux. The welders are available in 200-, 400-, and 800-ampere ratings.

G-E "BALANCED WAVE" GIVES STRONGER WELDS, FASTER TRAVEL SPEEDS—with reduced power and gas costs

Key to the advantages of the G-E "balanced-wave" Inert-Arc welder is the use of series capacitors in the output circuit. These capacitors block the d-c current which would otherwise be produced by the arc, and make it possible to get an even, uniform flow of a-c current.

This design, with the high-frequency pilot used only for starting, eliminates objectionable radio interference caused by welders using continuous high frequency.

You Get Stronger Welds, Faster Travel Speeds

Under identical conditions G-E "balanced-wave" welders give you a greater depth of penetration, better bead contours, and greater fusion area than welders with unbalanced-wave circuits.

This means, therefore, that an operator can do the job faster by using the G-E equipment.

G-E Inert-Arc Welders Give Even Flow of Current

Conventional Shielded-arc Welders Give Uneven Flow

Steady current from G-E "balanced-wave" welder gives better welding at lower cost than unbalanced-wave currents from shielded-arc equipment.

"Balanced Wave" of G-E Inert-Arc Welders Produces Deep Penetration, Wide Fusion Area

Unbalanced Wave of Ordinary a-c Metal-arc Welders Produces Shallow Penetration, Narrow Fusion Area

Above macrosections are from two pieces of ¼-inch aluminum, on which beads were run without the addition of filler metal, and under identical welding conditions.

G-E Inert-Arc Welders Can Reduce Your Power and Gas Costs

Because your operators can weld faster with G-E Inert-Arc welders, less gas and power are consumed. Saving in power costs and gas consumption have been estimated as high as 25% using G-E Inert-Arc welders, because of Idlematic control, series capacitors and momentary high-frequency pilot.

Holders and Tungsten Electrodes Are Designed for High-speed Work

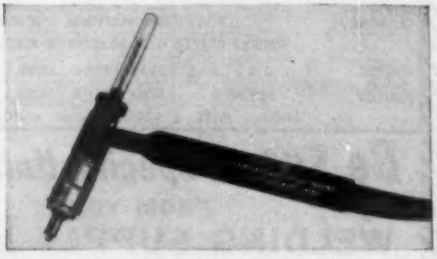
An operator can adjust by hand a tungsten electrode in the illustrated holder. No wrenches are required.

And he can do a wide variety of jobs with the same holder. Using it with a 200-ampere G-E Inert-Arc welder, for example, an operator can weld both light- and medium-gage materials, with electrodes up to eight inches in length in diameters of .040, $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, and $\frac{5}{32}$ inches.

To give you the right electrode for any job, G.E.'s 99.9% pure tungsten is available in a wide variety of diameters and lengths in both standard and thoriated types.

ASK ABOUT G.E.'s THORIATED TUNGSTEN

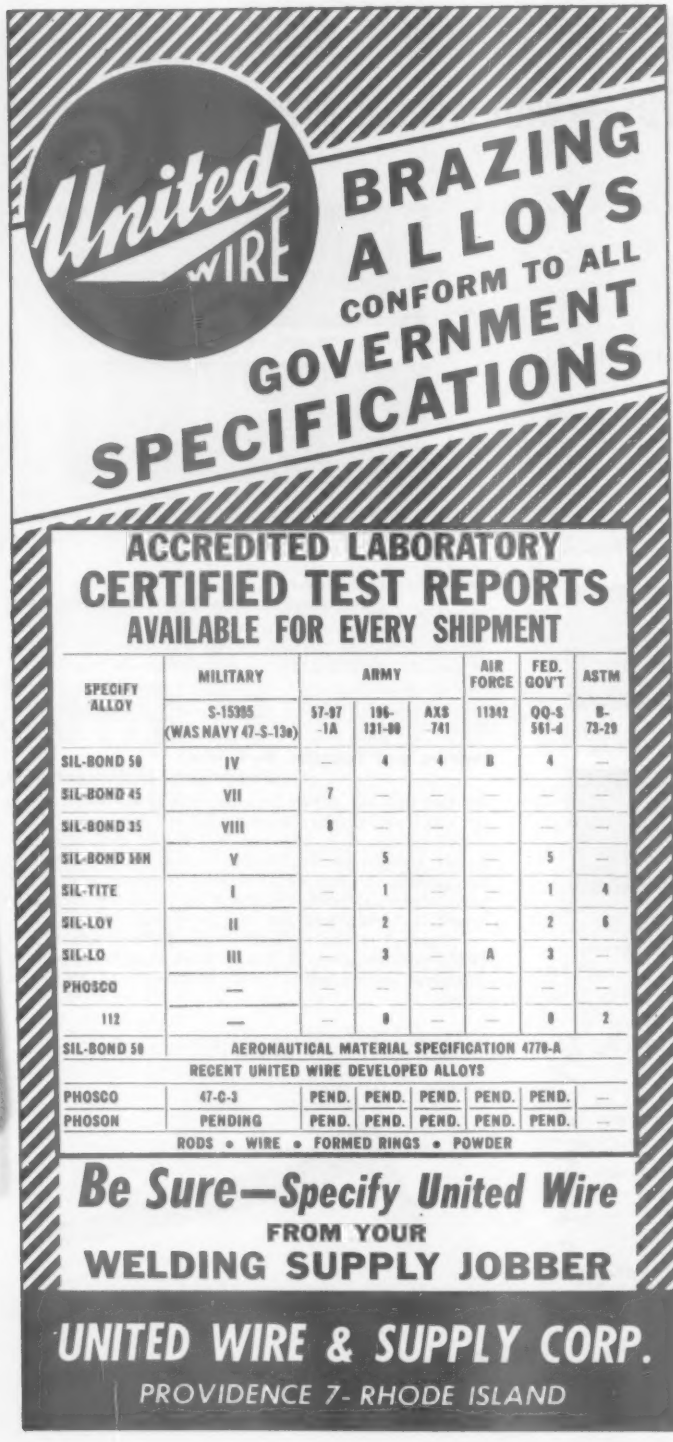
For d-c Inert-Arc welding only—you get 10 times normal electrode life with thoriated tungsten electrodes. Its strength compares with standard pure tungsten. Write today for more information. *General Electric, Schenectady, N.Y.*



Holders for G-E Inert-Arc welders are available for any current requirement from 15 amperes to over 800 amperes, a-c or d-c.

GENERAL ELECTRIC

711-15



SPECIFY ALLOY	MILITARY	ARMY			AIR FORCE	FED. GOV'T	ASTM
	S-15385 (WAS NAVY 47-S-13a)	57-97 -1A	196-131-50	AXS -741	11342	QQ-S 561-d	B-73-29
SIL-BOND 50	IV	—	4	4	B	4	—
SIL-BOND 45	VII	7	—	—	—	—	—
SIL-BOND 35	VIII	8	—	—	—	—	—
SIL-BOND 35H	V	—	5	—	—	5	—
SIL-TITE	I	—	1	—	—	1	4
SIL-LOY	II	—	2	—	—	2	6
SIL-LO	III	—	3	—	A	3	—
PHOSCO	—	—	—	—	—	—	—
112	—	—	0	—	—	0	2
SIL-BOND 50	AERONAUTICAL MATERIAL SPECIFICATION 4770-A						
RECENT UNITED WIRE DEVELOPED ALLOYS							
PHOSCO	47-C-3	PEND.	PEND.	PEND.	PEND.	PEND.	—
PHOSON	PENDING	PEND.	PEND.	PEND.	PEND.	PEND.	—

RODS • WIRE • FORMED RINGS • POWDER

Welding Sales Organization Formed by F. V. Schilling

FREDERICK V. SCHILLING, formerly supervisor, welding application engineering, eastern district, Westinghouse Electric Corporation, has formed a welding sales organizaton to serve western New York and northwestern Pennsylvania. Called The Schilling Company, its headquarters will be at 899 Maryvale Drive, Buffalo, N. Y.

Complete lines of arc welding equipment and supplies, resistance welders and controls; hydraulic pumps; controls and accessories and specialty tools and fixtures for the welding industry will be represented.

Mr. Schilling is a member of the American Welding Society, the American Society for Metals, and is a past chairman of the Niagara Frontier Section of AWS. His experience includes service as a specialist on welding with the War Production Board. He has been connected with welding design, application and sales for more than 15 years.

• • •

Norton Company Forms Distributor Advisory Council

TO BETTER tap the selling experience of its abrasives products distributors, the Norton Company has formed a Distributors' Advisory Council. Council membership at present is made up from representatives of eleven Norton distributors from Connecticut to California.

Many of Norton's problems are also the problems of the distributor, says Ralph M. Johnson, vice-president in charge of sales, abrasive division, and such a council will help both parties do a good job.

• • •

GE Will Build Big Turbine Plant Addition

MORE than 80,000 sq ft of floor space will be added to the General Electric Company's big turbine plant at Schenectady. Largest turbine plant in the world, the million square foot structure utilizes some of the biggest welded girders ever handled. The plant is also the largest field-welded industrial structure.

The new addition to the plant will make it possible to produce about 73 turbine generators per year representing 5,500,000 kilowatts.

• • •

Welder's Digest Changes Address

NEW mailing address of the *Welder's Digest* is P. O. Box 142, La Porte, Ind., announces L. C. Monroe, publisher.

ELECTRONIC MOTOR and WELDER CONTROLS

Just Published

1. This new book gives detailed explanations of the circuit operation of the tube-operated equipment found in the two major groups of motor and resistance welding control, and pinpoints each operation with clearly drawn diagrams. Takes up basic welding controls—sequence timers—synchronous timers—seam welding controls—speed control of d-c motors—the electronic ampledyne—rubber calendar control—etc. examining equipment of advanced design throughout. By George M. Chute, Application Engin., General Electric Co., Detroit. 348 pages, 187 illus., $6.50.

OXYGEN CUTTING

2. Shows how to make the most efficient use of the oxygen cutting process, emphasizing its practical applications, both new and old. Points up recent advances such as flame machining, flame scarfing, under-water cutting, etc. Covers metal temperature, plant facilities, types of cutting machines, multiple and stack cutting, etc. By George V. Slottman, Dir. of Research and Eng'ring, and Edward H. Roper, Asst. Tech. Sales Mgr., both of Air Reduction Co. 395 pages, 91 illus., $6.50.

OXYACETYLENE WELDING AND CUTTING

3. Shows you how to use the oxyacetylene torch more skillfully in everyday operations. Deals with flame cutting, bronze welding and brazing, the welding of various alloys, improved techniques in pipe welding, etc. Covers the field thoroughly . . . from basic information on lighting and adjusting a torch flame, to laying out a templet for cutting a 90-degree elbow. By Stuart Plumley. Revised by T. B. Jefferson. 4th Edition. 345 pages, 8½x11, 360 illus., $6.50.

AMERICAN MACHINISTS' HANDBOOK

4. Provides the answers to hundreds of questions on machine-shop standards and practice. You can locate quickly valuable information on layouts, speeds, feeds, tools, jigs, fixtures, materials, tolerances—any detail of machine-shop work. Pointers on machining special metals, and methods for difficult operations in drilling, grinding, punching, etc. are also given. By Fred H. Colvin, Editor Emeritus, *American Machinist*, and Frank A. Stanley, Formerly Editor, *Western Machinery and Steel World*. 8th Ed. 1537 pages, 2500 illus., $7.00.

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Photo courtesy Ryan Aeronautical Co.

Texas Welding Man Wins Flying Businessman Award

HAL W. Harman, El Paso, Texas inventor and welding shop owner recently won the distinction of being named "Flying Businessman of the Month." The award was conferred upon Mr. Harman by Ryan Aeronautical Company, San Diego, for flying 91 hours 30 minutes in one month in his Ryan "Navion" airplane.

Mr. Harman first learned to fly in 1946 when his "chainlock" metal joining process caught on at shipyards all over the country. Since then he has flown more than 500 hours on business every year.

For emergency repairs to oil field equipment, mines, power plants, big Diesel engines and steam power plants, Mr. Harman flies expert welders and equipment to points all over the Southwest. Lately, he has been flying to Odessa and Midland, Texas, where welded repairs to oil drilling rigs save investors thousands of dollars.

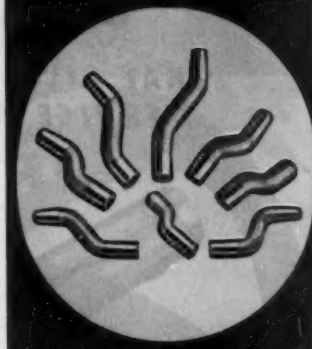
Such hurry-up flights to crews in the desert or to tiny hamlets, mean that Mr. Harman's plane has to land on wild prairies, small dirt airstrips and other unfinished locations. Mr. Harman reports that its rugged construction, largely welded (See Welded Airplane, p. 25, THE WELDING ENGINEER, Aug., 1949) withstands every test of rough service.

* * *

Saxe Moves Office

Van Rensselaer P. Saxe, well-known authority on welded steel buildings, has moved his office to 1701 St. Paul St., Baltimore 2.

For Longer Runs and Lower Costs



. . . resistance-weld with AMPCO WELD cold-bent tips

Ampco Weld cold-bent offset tips are made without patterns or special dies. Cold bending retains all physical properties too. Moreover, because holes bend with metal, there's no special drilling needed for water passages. That's why you get prompt service and fast delivery when you use Ampco Weld cold-bent tips.

But that's not all you get. You get longer runs and lower costs too — because the water passage gives you cooling right to the welding face. So, place your order today and enjoy all these advantages.

. . . and AMPCO *Engineering Service when you need it*

Behind the famous Ampco Weld line of resistance-welding products is a corps of experienced engineers, ready to help you solve your problems. Just get in touch with us.

AMPCO METAL, INC.

AMPCO

Dept. WE-6
MILWAUKEE 46,
WISCONSIN

It's Production-Wise to Ampco-ize

MW-2

WAGNER

ELECTRODE HOLDERS • GROUND CLAMPS

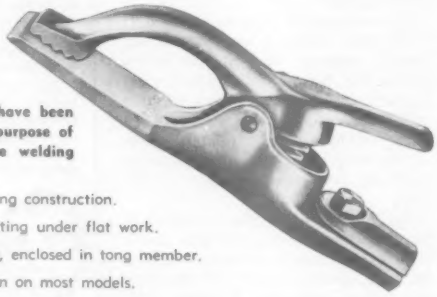
Design

THAT GIVES YOU EVERY SERVICE ADVANTAGE

Weld with Wagner

WAGNER electrode holders have been developed over a period of years to bring to the welder the long service life and cool operation necessary for economical operation.

1. High conductivity Arc-Resisting WAGNERLOY Tong Members.
2. Tough, heat resisting, high impact insulators.
3. Socket cable connection for either mechanical or soldered connection.
4. Powerful coaxial springs—adjustable tension on most models.
5. Patented channel construction for cool operation.



• Wagner ground clamps have been designed for the practical purpose of grounding the work to the welding machine.

1. Heavy WAGNERLOY tong construction.
2. Broad Flat Base for getting under flat work.
3. Powerful Coaxial spring, enclosed in tong member.
4. Adjustable spring tension on most models.

Wagner Welding Products are the result of more than thirty-three years of experience in welding and practical knowledge of mechanical and electrical engineering. WAGNERLOY, a copper alloy, was perfected by Wagner engineers to provide maximum conductivity, high arc resistance and great tensile strength.

Wagner Products ARE SOLD ONLY THROUGH WELDING SUPPLY DEALERS.

WAGNER MANUFACTURING COMPANY

350 W. 1ST SOUTH ST. JACKSON, MISSOURI

Ohio Welding Conference Draws Good Crowd

TWELFTH Annual Ohio State Welding Engineering Conference at Columbus, April 13-14, opened each day's program with an open house in the university's welding engineering laboratories. Students operated the lab equipment, demonstrated the instruction technique to the 300 or more welding engineers and other visitors attending.

Technical papers were read both days after the open-house periods. The first afternoon's papers dealt mostly with non-ferrous welding. Design, welding engineering applications and training were the subjects covered in the second afternoon technical session.

The Columbus section of the American Welding Society sponsored a dinner April 13 at the Fort Hayes Hotel for conference visitors. Talks were made by J. G. Magrath, national secretary, and Harry Pierce, national president of AWS. Mr. Pierce's talk was on the distortion and dimension control problems encountered in shipbuilding.

• • •

Tweco Shows Off New Office and Factory

GUESTS from all over the Midwest attended the open house late in April held by Tweco Products Company, Wichita, Kansas, to show new office and factory facilities. All manufacturing done by Tweco is carried on in the new 11,000 sq ft building, located at Boston and Mosely streets. A large machine shop department has separate divisions for plastics handling, cleaning and painting.

Represented on the guest list were many Wichita townspeople, friends of employees, welding distributors and suppliers.

• • •

"Old Time" Nelson Men Given Service Pins

WHEN a business hasn't reached its tenth birthday yet, five to nine years service makes an employee an "old timer." So 37 employees of Nelson Stud Welding Division, Morton Gregory Corp., Lorain, O., found out recently when they were awarded service pins. The group included 36% of all the workers on the payroll five years ago.

Pins were presented to the men by George E. Gregory, president of Morton Gregory Corp. Morton Gregory acquired the business in 1948 from Ted Nelson, who started it in his garage in Vallejo, Calif., in late 1941.

WELDERS
have no "Top Heavy" Feeling
with the Perfectly Balanced

AO HEAD-REST GOGGLE!

WELDERS' GOGGLES

Every gas welder, burner, cutter, brazer and furnace man finds a new friend when he first wears the AO F600 Head-Rest goggle of amazing comfort and convenience. Why? Because the goggle has no over-hanging weight—balance is perfect even when the goggle is in "off-guard" position.

Thumb screws provide speedy adjustment to facial contours and correct pupillary distance. Easy operating spring mechanism throws goggle to "off-guard" in a jiffy. Noviweld lenses shades 3, 4, 5, 6 or 8 — or Noviweld-Didymium lenses shades shades 3, 4, 5 or 6. Easily replaceable cover lenses guard filter lenses against pitting or scratching. When ordering, mention type of lens and shade desired. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

- Headgear of fibre fits snugly, comfortably.
- EYECUPS ARE OPAQUE AND SPECIALLY DESIGNED FOR WEAR DIRECTLY OVER EYES OR OVER PERSONAL GLASSES.
- Indirect, ventilated side shields block stray light rays, sparks and metal splashes from eye area.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

$1718 Saved

. . . by "Bronze-Facing" large gear with wear-resistant Ampco-Trode 300*

HERE'S a large 10'6" diameter tube-mill gear with 120 teeth and an 11-inch face. A new one costs $2,148. This one was made better than new by "Bronze-Facing" it with wear-resistant Ampco-Trode 300 for only $530. Time required for the entire job — 82 hours.

You, too, can enjoy the savings in time and money made possible by "Bronze-Facing" with Ampco-Trode. Other advantages are: longer life and less down time. For instance, after 5 months' service in a cement mill, this gear showed little or no wear — thanks to the 300 Brinell tooth-surface hardness provided by Ampco-Trode 300.

In these days of shortages and long deliveries you'll find Ampco-Trode bronze electrodes a big help. Get a supply today from your Ampco distributor or write us.

W-113

AMPCO

Ampco Metal, Inc.
Milwaukee 46, Wisconsin

It's Production-Wise to Ampco-ize

*Reg. U. S. Pat. Off., Ampco Metal, Inc.

GLASS-TO-METAL soldering process uses titanium hydride paints

Titanium Compound Helps Glass-to-Metal Soldering

A NEW soldering process joins glass to metal with a joint stronger than the parent glass. Essential to this important development, also used to solder metal to ceramics and carbon, is the chemical titanium hydride.

Both the glass and metal areas to be joined are painted with a thin layer of titanium hydride after which a soft solder is placed on both painted areas. The workpieces are placed together and heated inside a vacuum chamber to about 900 F when the titanium hydride decomposes. The solder, long since molten, then adheres to the titanium-painted areas of both glass and metal to form a strong tight bond.

Using soft solders in this glass-to-metal seal allows the joint to be subjected to rapid temperature changes without danger of cracking. Though the two materials expand at different rates under heat, the strain is absorbed by the soft solder fast enough to prevent fracture.

Now used in aircraft ignition systems, the process is also being investigated for applications in transformers, capacitors and electric motors.

Credit for the early work on the development goes to Floyd C. Kelley and Ralph J. Bondley of the General Electric Research Laboratory at Schenectady, N. Y. Present work is conducted by Lawrence J. Hogue, of the general engineering laboratory.

* * *

New and Bigger Plant For Vogel Tool & Die

VOGEL Tool & Die Corp., manufacturers of precision notching tools for piping, recently moved to a new plant in Melrose Park, Ill., three times larger than former facilities. At an open house in the new plant on May 5 more than 200 visitors and customers dropped in. Street address is 1825 North 32nd Ave.

56 TIPS on a practical idea

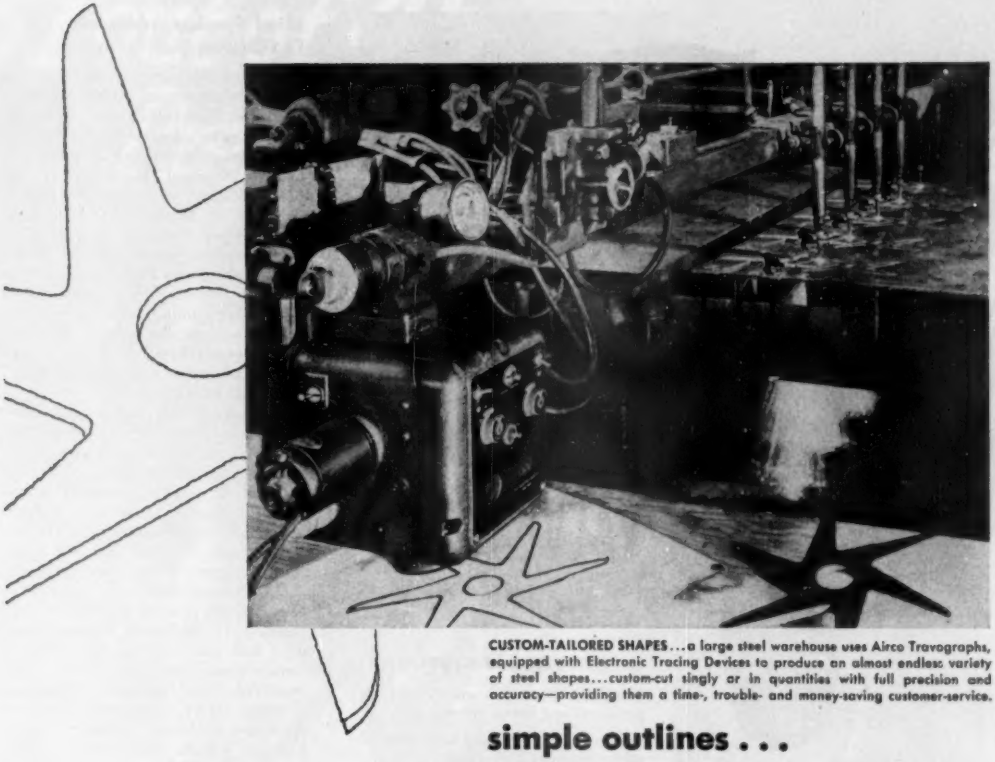
WEIGER-WEED

Spot Welding TIPS

In a single operation...with one flick of the wrist, 56 dependable WW Tips resistance-weld an automatic washing machine housing. In multiple welding operations like this, where every weld must be a good weld, the selection of the right spot welding tip becomes doubly important. For sound, clean welds—speedy welding—efficient cooling—long tip life—less down time—use WW Spot Welding Tips.

WW Tips are precision-machined of the correct alloys to provide the right physical and electrical properties. They are water-tight and electrically tight fitting. For the most dependable tips, both straight and offset—leak-proof holders—seam welding wheels—electrodes and dies—specify WW. They are available in numerous standard sizes from Weiger-Weed & Company, Division of Fansteel Metallurgical Corporation, 11644 Cloverdale Avenue, Detroit 4, Michigan.

Send for WW Catalog "Standard Replaceable Welding Tips — Standard Water-Cooled Holders"



CUSTOM-TAILORED SHAPES... a large steel warehouse uses Airco Travographs, equipped with Electronic Tracing Devices to produce an almost endless variety of steel shapes... custom-cut singly or in quantities with full precision and accuracy—providing them a time-, trouble- and money-saving customer-service.

simple outlines . . . intricate shapes cut to "AIRCO ACCURACY" *with*

AIRCO'S ELECTRONIC BLOODHOUND

Airco's new electronic tracing device, popularly known as the "Electronic Bloodhound", brings new economy and flexibility to machine gas cutting operations.

Designed for use only on Airco Oxygraph and Travograph gas cutting machines, the "Electronic Bloodhound" needs only an outline drawing or silhouette for a guide. One such low-cost, easily-prepared drawing or silhouette is sufficient whether one, a hundred, a thousand or more parts are to be cut in any design . . . from simplest to most intricate—inside and outside *square* corners, obtuse and acute angles, narrow slots, long slim projections, and many others. The Airco electronic tracing device follows the outline *automatically* to effect such accuracy of cutting that in most cases further machining is unnecessary.

For further data about this outstanding contribution to machine gas cutting, call or write your nearest Airco office today.

AIRCO **AIR REDUCTION**

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

REGO

HIGH PRESSURE
CYLINDER
VALVES

for OXYGEN and HYDROGEN

Designed, tested and proved for high pressures and severe service.

Packing may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

for ACETYLENE

Cadmium-plated steel stem with monel tip resists rust and wear.

Ball-nose seat construction assures positive shut-off.

for CARBON DIOXIDE

Available with diaphragm-type or packed-type construction.

Compact rugged design for use with high pressures.

Equipped with bursting disc safety device.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Co.
4201 West Peterson Ave. Chicago 30, Illinois

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

Blind Speaker Addresses IAA Meeting at Montreal

LUNCHEON speaker on the first day of the International Acetylene Association's Convention in Montreal, May 21, was scheduled to be Colonel E. A. Baker, managing director, Canadian National Institute for the Blind. Blinded by a sniper's bullet in Belgium in World War I, Colonel Baker helped found the institute.

Posthumous award of the James Turner Morehead Medal was made to M. Keith Dunham, late president of National Cylinder Gas Co., at the same luncheon. His son, J. W. Dunham, vice-president of National Cylinder Gas, was to receive the award on behalf of his father.

Speakers in the technical sessions on Monday and Tuesday afternoons discussed the following topics: welding engineering in design, George Nordenholt, editor, *Product Engineering*; training of weldors, William J. Small, superintendent, Niagara Falls Public Schools, Niagara Falls, N. Y.; flame cutting multpile parts, H. S. Swan, American Locomotive Co.; maintenance in the defense program, J. H. Redmond, Koppers Co.; pipe and tube welding, E. P. Auler, Taylor Forge and Pipe Works; safe practices, S. A. Greenberg, American Welding Society; dissolved acetylene regulations, Lionel Dimitri, L'Air Liquide Society and acetylene pipelines by W. G. Fogg, Air Reduction Co.

A trip to the Shawinigan Falls plant of Shawinigan Chemicals, Ltd., was planned for Wednesday, May 23.

(A complete report of the convention will appear in the July issue of THE WELDING ENGINEER.)

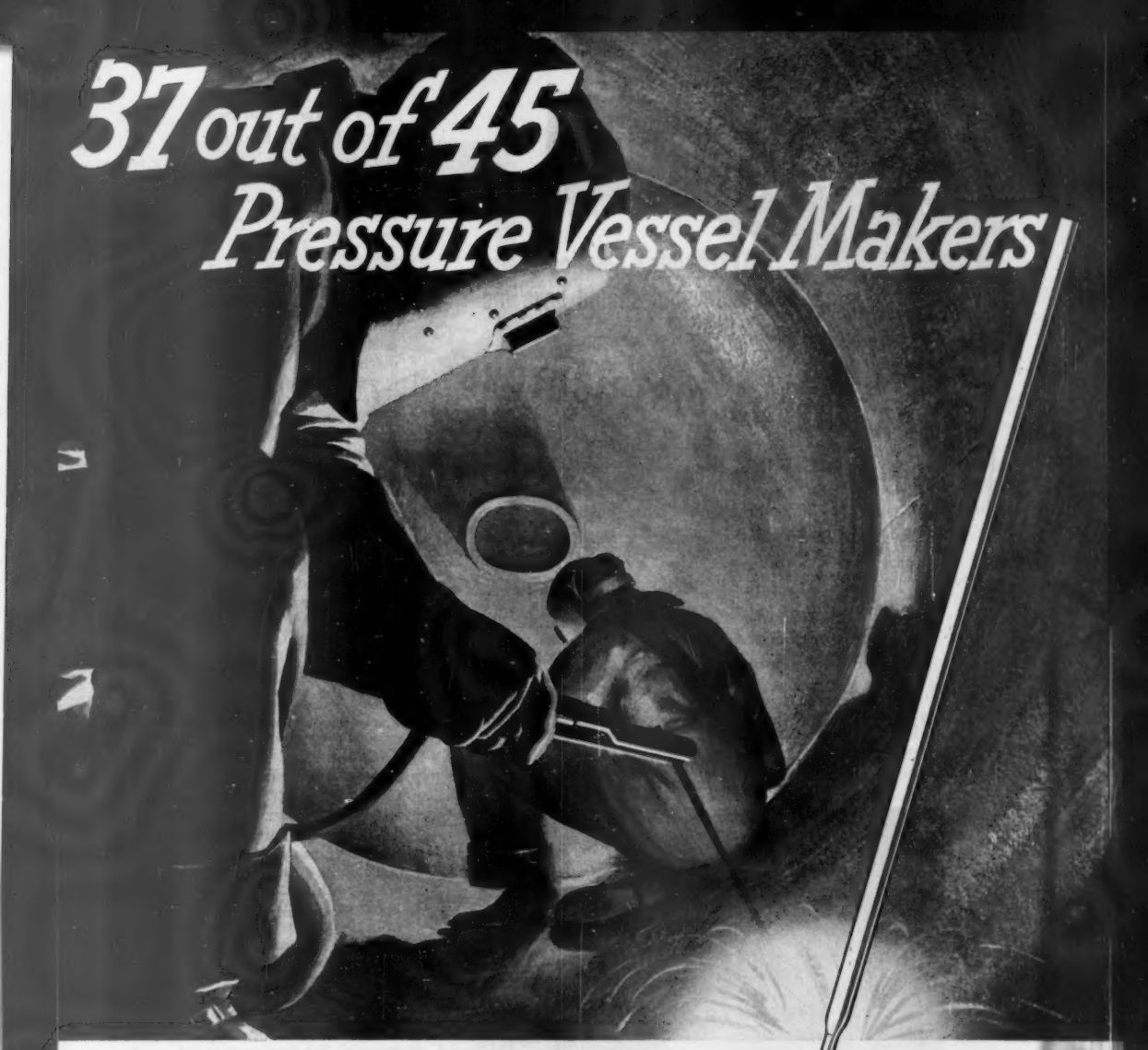
* * *

Technical Writing Service Helps You Get Contracts

OPERATING and instruction manuals are necessary parts of nearly every order for such complicated products as welders, machine tools, electrical machinery and electronic controls. To turn out such manuals is a highly specialized job—one that calls for that rare bird, a technically trained man who can write.

For companies who would like a manual written, The McGraw-Hill Book Company has established a technical writing service. Specially trained equipment-manual writers and illustrators familiar with military specifications co-operate with company personnel to make up manuals as specified in military contracts.

Further information may be obtained from John W. Wight, The McGraw-Hill Book Co., 330 West 42nd St., New York City 18.



Thirty-seven out of the nation's forty-five foremost makers of pressure vessels are long-time users of Murex Electrodes.*

In this industry, welding electrodes must provide high quality weld metal to meet rigid code requirements — must have high deposition rates to assure economy of production. These are two characteristics for which Murex electrodes are noted.

*Those having AAAA directory financial ratings.

WELD WITH...

MUREX®

METAL & THERMIT CORPORATION

100 EAST 42nd ST., NEW YORK 17, N. Y.

Electrodes • Arc Welders • Accessories

METAL FABRICATORS

helping America rearm with Aluminum should have the help of

LOCAL ALCOA DISTRIBUTORS

For group instruction in brazing or welding aluminum, there's nothing like Alcoa's technical library . . . 4 how-to-do-it motion pictures plus a 186-page book. Ask your Alcoa Distributor about them. You'll find him listed under "aluminum" in your classified phone book.

Or write ALUMINUM COMPANY OF AMERICA, 1943F Gulf Building, Pittsburgh 19, Pennsylvania.

Oxide-free joints are easy to weld in aluminum. Ask your Alcoa distributor.

ALCOA FIRST IN ALUMINUM

Goes to Races and Sells Silver-Brazing Order

A GOOD salesman doesn't miss a selling chance even when he's playing hookey: Here's a neat example from the All-State Welding Alloys Co., Inc., White Plains, N. Y.

A salesman for an All-State distributor in California had decided to take the day off and view the ponies at the Santa Anita racetrack. Strolling near the paddock before post time, he saw a damaged mowing-machine gear being used as a shed door stop.

Forgetting the bangtails momentarily, our hero looked up the Santa Anita maintenance and grounds man and asked him for a chance to replace the damaged gear teeth by silver brazing.

The job was successful and the gear was put back to work. After inquiring about other applications of silver brazing, race track officials decided to sweat the caulks onto the racing shoes for the horses. Both uses resulted in a sizable order for 3/16-in. silver-brazing rod from the track.

Moral: some people will always win at the races.

* * *

Vanadium for Steel Scarce and Expensive

ONE of the rarest and most expensive alloying elements used by the steel industry, vanadium can only be obtained from small deposits in difficult mining terrain. Its ore is usually mixed with that of uranium.

About 1,000,000 lb of this grayish white, soft, ductile and malleable alloying metal are used for steel-making which takes 90% of the total consumption in the U.S.

First major use of vanadium steels in this country was in the automobile industry about 1907. Applications of these steels to axles, springs, crankshafts and gears brought out their advantages for other fields. Today, cutlery, surgical instruments, springs, oil field tools and many other products are made from vanadium steels.

The world's largest vanadium mine is in Peru at an altitude of 15,400 ft. Northern Rhodesia, southwest Africa, Argentina and Mexico also mine vanadium ores. In this country, a series of small mines in southwestern Colorado, Utah, New Mexico and Arizona supply nearly half of the world's output.

The steel industry used vanadium in the form of ferrovanadium which is about 40% pure. This same form of vanadium goes into welding electrode coatings and deoxidizers.

Longer Life

with COLMONOY hard facing

Reports from every industry show longer equipment life after hard facing with Colmonoy.

Colmonoy hard facing shows the way to longer life for your equipment and machine parts. No matter what is the cause of wear, Colmonoy has the answer to restore worn parts and protect your new parts. You'll find protection against abrasion, corrosion, and impact in its complete line of hard facing alloys. Depending on your needs and facilities, Colmonoy is available in the form of rods, electrodes, paste, powder, metallizing wire, and castings. Colmonoy offers other advantages:

Easy to apply. Any weldor, without special training, can pick up Colmonoy and do a good job. No danger of expensive rejects. Colmonoy reduces welding time on every job.

Lower welding temperatures. Lower temperatures means less chance of part distortion. You save on gas or welding current, too.

The Sprayweld Process. Powdered Colmonoy can be sprayed and then welded to the part. Spraywelding uses less material and is faster than hand-welding. A Sprayweld surface is smooth and can be held to within .010". No patching or rejects. Write for more information.

Complete engineering data for applying Colmonoy on typical jobs in any industry available on request.

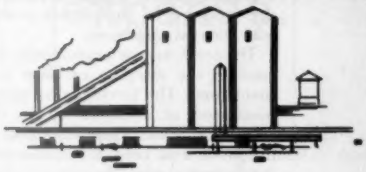
AGRICULTURE

Plow shares treated with **Colmonoy** sweat-on paste hold their edges and last up to 17 times longer.

CHEMICAL and OIL REFINING

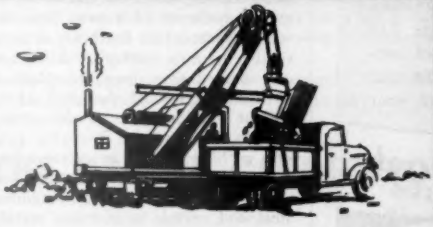
Pump parts spraywelded with **Colmonoy No. 6** give 600% more service even when operating in Caustic or Sulphuric.

Valves, operating in even the most corrosive mineral acids, last 5 times longer when protected with **Colmonoy No. 5** rod.



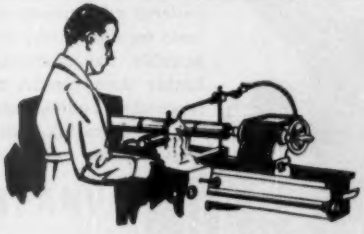
CEMENT

Mill hammers faced with **Colmonoy No. 1** crush 300% more rock.



CONSTRUCTION

Shovel teeth built up with **Colmonoy No. 1** reduces maintenance cost over 70%



METALWORKING

Colmonoy center tip castings soldered on new or worn centers wear from 7 to 10 times longer.

ORDER FROM YOUR LOCAL JOBBER

WALL COLMONOY

CORPORATION

HARD FACING ALLOYS

19345 JOHN R STREET DETROIT 3, MICHIGAN

Federal

AUTOMATIC FEEDING DEVICES BOOST PRODUCTION AS MUCH AS 400%

Typical Dial Feed Unit

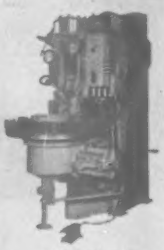
If you are making long runs of welded parts, and are interested in increasing production and product quality, you should know about Federal Welder indexing tables, dial feeds, automatic feeding, loading and unloading devices.

Ideal for large production runs, these Federal automatic devices pay for themselves in short order. Usually adaptable to a standard welder, they reduce the cost of the completed assembly by reducing the man hours required to perform the welding operation. It is not uncommon for an automatic feed to quadruple production over the hand fed method, and, in addition, save 50-70 percent of assembly time.

Federal automatic feeding devices lower production time by eliminating welder down time, and by eliminating fitting, clamping and other operator handling required by piece work methods.

Federal automatic devices permit the welder to deliver welds of consistent high quality and uniformity. Once conditions are set they continue with every weld — eliminating the chance of human error.

Hopper, automatic feed, automatic ejection unit attached to welder



Dial Feed with automatic ejection

Magazine type Automatic Feed

Federal can furnish automatic equipment for almost any welding operation suitable for automatic feeding. For further data contact the Federal representative nearest you — or write and we will have him call on you at your convenience.

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Federal® WELDERS

Warco PRESSES®

WELL PLANNED cutting dock means easier cutting of skulls

Efficient Cutting Dock Speeds Scrap Reduction

ECONOMICAL cutting of skulls and buttons from steel mills necessitates a well-designed mounting for the cutting torch and an efficient arrangement of the cutting dock. Otherwise, many of the advantages of flame-cutting can't be fully realized.

An efficient set-up at one steel company's scrap yard is shown above. Skulls and buttons are cut with a special torch having a powder-cutting attachment. It is mounted on a carriage that pulls a 200-lb powder dispenser on a trailer. The powder is always in the correct position with this arrangement.

The torch arm is permanently fastened to the machine carriage by a pivot joint. The torch can be quickly positioned at distances up to 8 ft from the track. Counterweights on the torch arm keep it in balance. A small motor controls up and down movement of the torch.

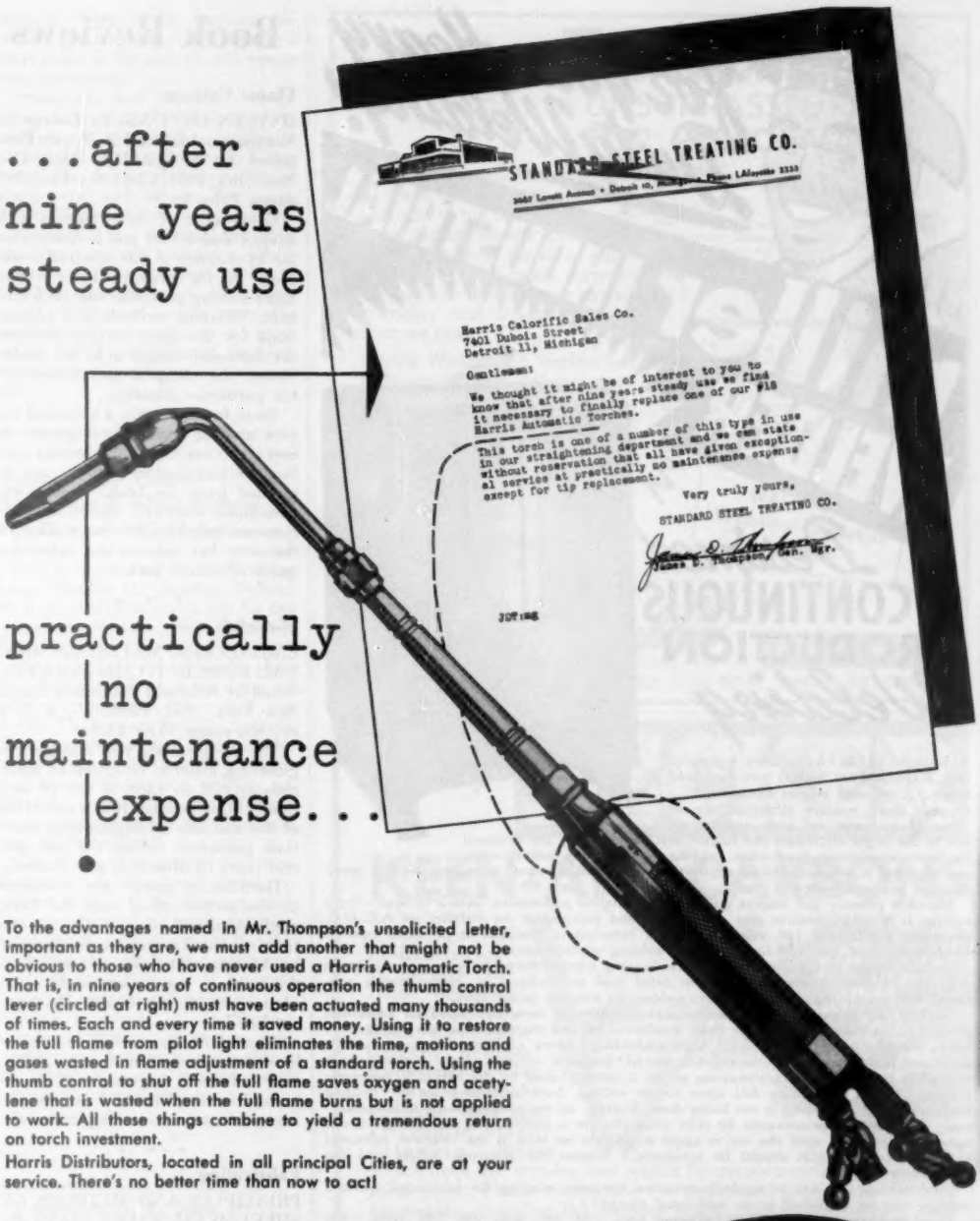
A unique feature of this installation is the pantograph mounting of the tracks carrying the flame-cutting carriage. Though remaining parallel to the cutting dock, the tracks can be moved as far as 10 ft away from the wall supports. This flexibility of positioning permits cutting of skulls into any desired size along any plane.

Cutting speed of the skull above was at 1½ ipm. The powder-cutting process, in which an iron-rich powder is blown into an oxyacetylene flame for increased oxidation, can also be used to cut cast iron, stainless steel and certain nonferrous metals.

• • •

RALPH HENDERSON EVERETT was elected a director for three years of Automatic Steel Products, Inc., Canton, O.

...after nine years steady use


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

practically no maintenance expense...

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

• With MILLER Heavy Duty Industrial Arc Welders (100 Series) you can weld faster . . . on some jobs as much as 35%, because these welders eliminate the ill effect of magnetic arc blow and permit you to use larger electrodes and higher heat values. They are designed for heavy continuous production welding — for heavy custom welding jobs and automatic welding applications . . . built to equal or exceed NEMA specifications for rated output.

Movable primary coil insures quiet stepless ampere adjustment. Standard open circuit voltage is 80 which insures easy arc striking and exceptional arc stability on A.C.-D.C. electrodes (additional 100 volt open circuit terminal is provided at no extra cost on Models 107, 108 and 109 for automatic welding applications).

Built-in Power Factor correction reduces lagging current drawn by conventional design A.C. arc welders. Primary amperes—at rated load are reduced by approximately one-third, thus permitting use of more arc welders on existing power lines.

In MILLER Heavy Duty Industrial Arc Welders we have developed an additional protection for personal safety for those conditions beyond the control of the operator . . . where welding must be done from high scaffolding—where excessive dampness exists—or where highly corrosive atmospheres prevail. Reduced voltage on the welding leads where the operator is not maintaining an arc is accomplished by the MILLER automatic voltage reducer, preventing full open circuit voltage from remaining on the welding leads when actual welding is not being done. Voltage on the welding leads is instantaneously reduced to approximately 30 volts when the arc is broken, and full voltage is not again re-established until the arc is again struck. At no time is the operator subjected to more than 30 volts should he accidentally contact the electrode holder and the work material.

Dual voltage 220/440 is regularly provided (primary winding for additional optional voltages can be furnished at no additional charge).

These welders are available in following sizes: 200, 300, 400, 500, 750, 1000, 1500 amperes (rated secondary amperes). We also manufacture welders specifically designed for the submerged arc welding process. The three-wheel steel truck is available for Models 102, 103, 104 and 105.

See the MILLER distributor in your territory today for a demonstration of MILLER Heavy Duty Industrial Arc Welders or write us for complete details.

ARC • SPOT miller WELDERS

miller ELECTRIC MANUFACTURING CO.

SINCE 1929 APPLETON WISCONSIN

Book Reviews

Flame Cutting

OXYGEN CUTTING. By George V. Slottman and Edward H. Roper. Published by McGraw-Hill Book Co., New York, 1951. Cloth, 6 x 9 in., 395 pages. Price $6.50.

Every type of flame cutting with oxygen and a fuel gas is covered in the 24 chapters of this practical book. Most of the answers to everyday flame cutting problems can be found here. Different methods and adaptations for the same cutting problem are discussed enough to let the reader choose the cheapest and fastest for his particular situation.

Basic fundamentals, a historical review and the newest developments in every process from non ferrous cutting to underwater cutting, can be gleaned from the book. Concise explanations and well chosen illustrations not only simplify the reading of the text, but enhance its value for quick reference work.

* * *

Materials

ENGINEERING MATERIALS MANUAL. Edited by T. C. Du Mond. Published by Reinhold Publishing Corp., New York, 1951. Cloth, 8½ x 11½ in., 386 pages. Price $4.50.

The complete story of a single engineering material or group of materials is told in each of the 28 sections of this volume. It is a collection of the manuals on engineering materials published during the last several years by *Materials and Methods*.

Hard-facing metals are discussed in one section along with the basic application methods and selection criteria needed for each. A directory of hard-facing materials is included in this section, but unfortunately some of the recently developed alloys are not listed.

As a whole, the manual is comprehensive and very useful as an industrial reference, a source of background information and as a teaching guide to engineering materials.

* * *

Fabricating

PRINCIPLES AND METHODS OF SHEET-METAL FABRICATING. By George Sachs. Published by Reinhold Publishing Corp., New York, 1951. Cloth, 6 x 9 in., 526 pages. Price $10.

Five aspects of sheet metal fabrication are discussed in detail in this book. They are: sheet metal and sheet metal parts, principles of forming parts, deep drawing, press-die forming and other sheet metal forming

methods. Much of the forming discussed refers to the cold working of sheet metal in the aircraft and equipment industries.

Systematic and detailed descriptions of the numerous sheet forming methods in use today emphasize meaningful similarities and differences. The theory of deformation of sheet metal and tubing; the metallurgical effects of stamping, extruding, drawing and bending; the physical operations and production equipment needed are also presented.

While the welding of sheet metal parts is discussed briefly, assembly methods are not covered to any great extent. Primary concern of the book is to impart metal-forming information.

Westinghouse Teaches Newest Arc Welding Methods

THE latest arc welding techniques and apparatus were shown in a recent school program run off by Westinghouse Electric Corporation, Buffalo, N. Y., in May. The course ran for five consecutive Monday evenings for two hours each.

Purpose of the school was to show the effective and economical use of welding equipment, labor and materials. The sessions included lectures, films, and discussions. Chairman for the welding school was F. V. Schilling, former supervisor, welding application engineering, for Westinghouse's eastern district, who is now in business for himself.

The school program included these lectures by Westinghouse personnel: welding design, C. H. Jennings, engineering manager, arc welding department; welding metallurgy, E. R. Gamberg, engineer, electrode department; electrode applications, E. H. Turnock, manager, electrodes department; arc welding apparatus, E. F. Steinert, manager, welding apparatus engineering and automatic arc welding, H. J. Bichsel, design engineer, welding apparatus engineering..

* * *

Compressed Gas Meeting At Absecon, N. J., June 20

THE summer meeting of the Compressed Gas Association, Inc., will be held at the Seaview Country Club, Absecon, N. J., June 20-22. First two days will be devoted to committee meetings while the third day, June 22, will be taken up by the sports program. Association address is 11 West 42nd St., New York 18.

Weldit INC SINCE 1918

TORCHES... UNSURPASSED FOR TOP PERFORMANCE

FOR 33 years management men and welding operators combine to put the stamp of approval upon *Weldit torches* for these important reasons; superior quality of work, greater productive capacity, gas saving economy and minimum maintenance cost.

Weldit Weldimatic torches are indispensable for defense work because they will increase your production up to 148% plus an average gas saving per operator of $4.80 per day.

The Weldit Model W-46 Weldimatic welding torch with built-in automatic gasaver. Safe — Speedy — Rugged — Light. —

The *Famous Weldit Gasaver* Model E — The *original* gas saving unit cuts gas consumption 25 to 30%. Eliminates fire hazards and increases defense production.

Weldit Torches . . .
For The Man Who Carries The Torch.

WRITE FOR Technical Bulletins Nos. 3 and 9.

994 OAKMAN BLVD — Weldit INC SINCE 1918 — DETROIT 6, MICH

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KEEN-ARC CARBONS

FOR CONSISTENTLY GOOD RESULTS

Designed to carry the high currents necessary for intense heat, BBB Keen-Arc Carbons produce a fine-grained weld of high tensile strength. They give a smooth, steady "flowing" flame which does not wander and which is concentrated at the desired focal point. Flame temperature is easily and accurately adjusted by merely changing the ampere input, and heavy copper coating permits gripping at extreme ends—eliminates frequent and periodic resetting.

A COMPLETE LINE OF CARBON WELDING SUPPLIES including carbon and graphite electrodes, carbon rods and plates, welding paste, etc.

Write for catalog.

BECKER BROTHERS CARBON CO.
3450 South 52nd Ave. Cicero 50, Illinois

WHISK OFF WELD SPATTER

You speed up welding—and save up to 85% of weld cleaning time and labor—when you apply Protect-O-Metal No. 2 before welding. Just brush or spray it in weld seam and adjacent metal—weld—then whisk off spatter in a matter of seconds. Protect-O-Metal will not cause smoke, fumes or odors. One coat serves for single or multi-pass welding. Costs 1/10c per foot of weld, saves up to three times its cost in time savings alone.

Order a trial gallon ($3.25) satisfaction guaranteed or invoice will be cancelled.

PROTECT-O-METAL

POM

GWSMITH

G. W. Smith & Sons, Inc. 5408 Kemp Rd., Dayton, O.

YOU HELP OUR NAVY GET MORE CRUISERS

When You Salvage Worn CRUSHER ROLLS with . . .

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945

11% - 13½% Manganese-Nickel Steel

ROUND APPLICATOR BARS

1. MANGANAL ROUND APPLICATOR BARS speed repairs, replace worn metal faster and more economically.
2. ROLLS rebuilt with MANGANAL often outlast new ones.
3. 12 SIZES of MANGANAL Round Applicator Bars are available for all conditions of wear.
4. ATTACH with MANGANAL Bare or Special Tite-Kote Electrodes for greatest strength, longest wear.

Write TODAY for FREE Literature . . . outlines newest methods of economical repairs.

NAME OF NEAREST DISTRIBUTOR UPON REQUEST

STULZ-SICKLES CO. SOLE PRODUCERS 92 N. J. Railroad Ave. Newark 5, New Jersey

Hard-to-Handle Ozone Tamed by Research

CONCENTRATED liquid ozone has great possibilities as a rocket fuel, as a source of oxygen for submarines or high flying airplanes and as an agent for purifying water, air and other substances. But!—it isn't that simple because ozone explodes or decomposes very readily.

Ozone has three oxygen atoms for its molecule instead of the two atoms that constitute the oxygen molecule. How to manufacture and handle it safely has been the subject of a 6-year research program. The research was sponsored by the Air Reduction Company, Inc., and was carried on at Armour Research Foundation, Chicago. Supervisor of the work was Clark E. Thorp, who has had more than 15 years experience in the field and is a recognized authority on the subject.

Ozone may replace fluorine, another hard-to-handle chemical, in certain rocket fuel experiments because of the hard-earned knowledge about handling it. Until two years ago, ozone studies were constantly dangerous as well as interesting.

One unscheduled explosion per day was about par for the researchers until they learned that ozone could be made to behave by removing certain thermal, mechanical, electrical and chemical sensitizing influences.

Today, planned explosions rock the laboratory as tiny drops of ozone are set off by remote control. Aluminum cups are mutilated by drops as small as the head of a pin. "We probably scare a lot of pedestrians, but we're learning more about ozone every day," Thorp says.

During World War II, German scientists worked overtime on an ozone-propelled rocket designed to bombard New York City from launching platforms over 4,000 miles away. Luckily for us, the Germans weren't able to discover how to handle liquid ozone without spontaneous explosions.

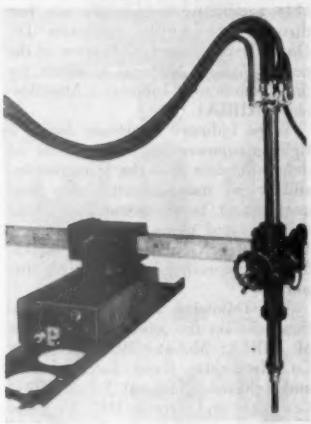
In the future it may be possible to replace oxygen tanks in airplanes and subs with containers of ozone. This would give greater space to the crews with no sacrifice in oxygen.

Used for water purification, ozone literally "burns up" impurities without leaving an unpleasant taste. Philadelphia, Paris, and small towns like Whiting and Hobart, Ind., have used ozone water purification systems for years.

Ozone is also used to deodorize ventilating systems, bleach paper, pulp, blood, starches and oils. As yet it has no applications to welding, but you never can tell.

NEW PRODUCTS

(Continued from page 46)



Big Flame Cutter Nicks Billets, Rips Slabs

THE new Airco No. 41 "Radiagraph" is a motor-driven, straight-track guided apparatus for the heaviest types of cutting, welding and flame-hardening operations. In steel mills, it is used for billet nickings, slab ripping and skull cutting. Wide speed range and accuracy make it valuable in maintenance shops for flame-hardening of precision parts.

The frame is all-welded and has an insulated bottom plate to protect internal parts from heat. The speed range is 1 to 72 rpm.

The following attachments can be mounted on the traveling carriage: the Airco plate edge preparation device, the Airco motorized torch arm and holder assembly, the manual torch arm and holder assembly (shown above) and automatic welding apparatus such as the Airco automatic "Heliweld" head and the "Aircomatic R" head.

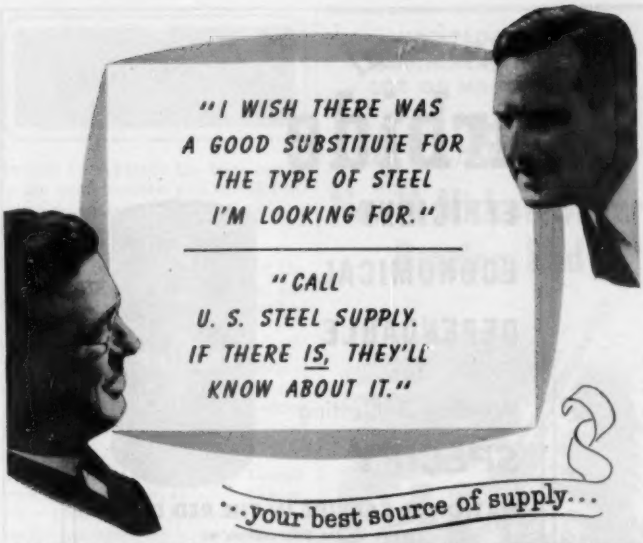
AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

* * *

Plastic Cover Plates Resist Weld Spatter

A RESISTANCE to weld spatter of as long as 1,000 hours is claimed for the GS No. 125 plastic cover plate. The transparent plastic is said not to crack, warp nor impair the transmission of light in any way. Comparatively inexpensive, it shields the more costly welding filter plates. The standard size of 2 by 4¼-in. will fit many welding helmets and hand shields.

GENERAL SCIENTIFIC EQUIPMENT CO., 2700 West Huntingdon St., Philadelphia 32.



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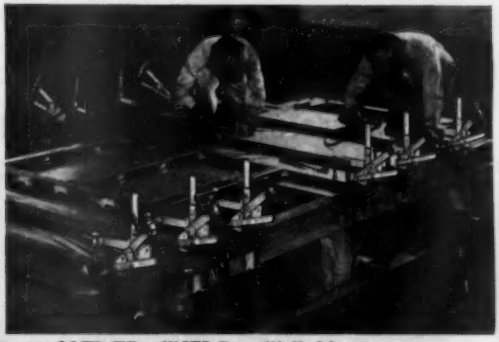
PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · ROCKFORD, ILL.
TOLEDO · TULSA · YOUNGSTOWN
Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL

Production Welders Locate and HOLD with "DE-STA-CO" clamps



Revised 32-page catalog of toggle clamps, accessories, applications. Template sheets for efficient fixture design.

Precision clamp manufacture and high holding-pressures are the "secret" of this efficient welding fixture. Locating pins welded to clamp bars hold channels in positions to weld variable length assemblies in this versatile fixture. "De-Sta-Co" reamed holes and hardened pins assure accurate positioning of parts. Positive holding pressure forces cross members and plates into close contact essential for strong production welding. And "De-Sta-Co" quick toggle action makes loading a job untrained workers, even women operators, handle with ease, in seconds.

More than forty "De-Sta-Co" models—including new portable and plunger clamps—offer quick solutions to your locating and holding problems. The "De-Sta-Co" stocking distributor in your area is qualified to assist you; call him in, or, if you haven't met him, write for his name and your copy of our catalog, today.

DETROIT STAMPING COMPANY

372 MIDLAND AVE. • DETROIT 3, MICHIGAN

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM
Write us for information as
to nearest available stock.
NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

CYLINDERS
FOR
ALL GASES

10 C.F. 40 C.F. 60 C.F. 100 C.F. 150 C.F. 250 C.F. 300 C.F. 340 C.F.
INDEPENDENT Acetylene Cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Storage cylinders available in 12' and 20' lengths, of 850 and 1,500 cu. ft. capacities.
INDEPENDENT ENGINEERING COMPANY, Inc.
Manufacturers of
CONSULTING · DESIGNING · RESEARCH
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS
We Invite Your Inquiries

Institute Formed To Combat Absenteeism

MORE than 10% of America's available productive man-hours are lost through absenteeism, estimates Dr. David Hertz, executive director of the newly formed National Institute for the Reduction of Industrial Absenteeism (NIRIA).

When industry is already facing a tight manpower supply in view of defense orders, it is the joint responsibility of management, labor and government to do something about the losses of absenteeism, maintains Dr. Hertz. NIRIA has been established to specifically accomplish this purpose.

The following national organizations are on the advisory committee of NIRIA: McGraw-Hill Publishing Co., Remington Rand, Inc., Johnson and Johnson, National Broadcasting Co., Yale and Towne Mfg. Co., Revere Copper and Brass, Inc., Wilcox Gay Corp., Pepsi-Cola Co., Dun & Bradstreet, Whalen Drug Co., Esso Standard oil Co., Gimbel Bros., Consolidated Edison of New York, Mays Department Store, R. H. Macy & Co., Lilli Ann Corp. and Mutual Life Insurance Co.

Functioning as a non-profit research organization on a membership basis, NIRIA will provide information and data on the subject of absenteeism to its members in a monthly bulletin and a quarterly journal. Participating members will have available the research facilities of the Institute for specialized investigation.

• • •

Milwaukee Welding School Buys New Building

THE Milwaukee School of Engineering recently purchased the nearby Jewish Community Center building, which adds 16,542 sq ft of floor area to the school. The addition includes 34 rooms, counting an auditorium and offices. The building was originally built in 1912 as a complementary structure to the present MSOE building.

The Milwaukee School of Engineering is well known for its welding curricula (see THE WELDING ENGINEER, April, 1951, p. 30).

• • •

Raytheon Moves New York Office

NEW address of the New York City and international sales offices of The Raytheon Mfg. Company is 19 Rector St., New York 6. The telephone number and cable address will remain the same. Products to be sold through the offices will include resistance welders.

THE
ARC-FIT
PROCESS
Tube notched with special ARC-FIT
Angular notch on tubular member.
Square tube notched to fit square pipe.
Angle joint on two pipes.
"T" notch on end of Tubular member.
Pipe Notched with deep slot.
"T" joint on tube or pipe.
Angle Iron notched to fit pipe.

TOPS IN SHOP EFFICIENCY

5 seconds to notch Tubing and Pipe Ends

The answer to many problems confronting large and small shop owners. No shop can afford to be without the ARC-FIT—no matter how large or how small. Manual or power operated—fits the ARC-FIT hand press or any standard power press.

ARC-FIT is a patented precision-built shearing tool which prepares the ends of tubing or pipe to produce welded or brazed tubular "T" or angle joints. ARC-FIT will not deform the tube or pipe and no further finishing is required—no sawing, cutting, or removing sections with milling cutters. Our literature gives many fine points on operation, construction, and application—send for it today —also write for quotations.

VOGEL TOOL & DIE CORPORATION

1825 N. 32ND STREET
Dept. W-E
MELROSE PARK, ILL.

About People

JOSEPH G. SURMACZ has been named to the newly created post of chief industrial engineer of Harnischfeger Corp.

* * *

FRED H. HAGGERSON, president of Union Carbide and Carbon Corp., has been elected chairman of the board of directors.

* * *

RICHARD J. BROWN has been named advertising and sales promotion manager of the Delta Power Tool Division of the Rockwell Mfg. Co., Milwaukee.

* * *

J. DOUGLAS DAWSON, Norton Company's traffic manager, abrasive division, since 1946 has been appointed general traffic manager. He succeeds ELMER B. JONES, who is retiring after 22 years service. ROBERT D. LAWSON is the new sales manager of Norton's grinding machine division. Lawson succeeds C. DENSON DAY, who resigned to go with Machinery Associates, Inc., Philadelphia.

* * *

J. R. COLLINS has been transferred to the new Chicago sales office of Arcos Corp.

* * *

RALPH O. ANDERSON, Norton company district manager in St. Louis, has been appointed by the National Production Authority to serve in its machinery division as abrasive consultant.

* * *

ROBERT J. RYAN has been elected president of Nooter Corp., St. Louis, to succeed the late Elmer J. Nooter, who died April 14. He is an authority on arc welding processes and is vice-president of the Steel Plate Fabricators Association.

* * *

DR. CLARENCE H. LORIG, assistant director, Battelle Memorial Institute, Columbus, O., received a distinguished service citation from the University of Wisconsin on May 4 for his many accomplishments in metallurgical engineering.

* * *

C. STEWART PARSON, O.B.E., director, mines branch, Department of Mines and Technical Surveys, Ottawa, Canada, was recently awarded the Inco Platinum Medal by International Nickel Co., Inc., for meritorious contributions to the mining and metallurgical fields.

WAR PRODUCTION MACHINERY TAKES A LOT OF MAINTENANCE

ALL-STATE No. 11 Nickel-Silver Brazing Rod

This most versatile of all All-State alloys makes strong dependable joints in 14 metals and any combination of them. Because each of these different kinds is used importantly by the Arsenals of America, there is no definable end to the applications of No. 11 in the defense establishment.

Nowadays, with war material dominating industrial activity, those without defense orders frequently have to wait for All-State No. 11. Critical nickel is a basic ingredient of this rod.

No. 11 melts at 1660° F. and flows at 1750°. Makes neat welds. *Fully machinable through the line of fusion.* It is stronger than mild steel in small fillet and beveled butt joints — 85,000 psi. tensile, 160,000 psi. shear.

For complete details ask for new All-State 32-page booklet. This is a Buyers Guide to the complete line of ALL-STATE Alloys and Fluxes for Welding, Brazing, Soldering, Cutting and Tinning. Any A-S distributor can give you one.

A-S DISTRIBUTORS EVERYWHERE

ALL-STATE

WELDING ALLOYS CO., Inc.
White Plains, N. Y.

MORE SPEED than You Need—

Just Add

WELD-AIR-MATIC

to your

Old Rocker Arm Welders

Your present rocker arm spot welders can *really* produce *extra* profits—for all it takes is the simple installation of a compact Weld-Air-Matic. This self-contained control unit *air-powers* your welder—adds *speed, accuracy, ease of operation never* before possible with your present foot-operated welder.

Tests Prove 10,000 Welds Hourly on Continuous Daily Schedules

The Weld-Air-Matic provides a feather-touch foot switch that controls pressure and energizes a coil on a four-way operating valve. Employing reduced air pressure of 15 to 50 lbs., it has a maximum stroke of 1½" on size 1 unit, 2" on size 2, and 2½" on size 3 unit. Requires any standard Weld Timer and a minimum of 4 cubic feet air supply per minute, with 80 lbs. minimum line pressure. Three sizes available with all accessories mounted to one strong aluminum alloy casting.

Get the facts now on how you can break all previous production records of your present equipment, by modernizing with the new Weld-Air-Matic. You can't lose — for the savings you make will quickly account for Weld-Air-Matic's nominal cost.

DEALER TERRITORIES AVAILABLE—
Information on Request

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ROBT. W. HOFFMAN COMPANY, INC.
40 South Clinton Street **Chicago 6, Illinois**

IMPORTANT

NEW USES

MEAN THAT YOU CAN

SAVE MONEY

WITH

3 in 1 "York's 77"
SPECIAL FLUX

FOR...

- GENERAL BRAZING
- CAST IRON WELDING
- CAST IRON BRAZING

NO NEED TO STOCK
3 DIFFERENT FLUXES
WHICH DETERIORATE
WHEN ONE CAN OF
"York's 77" 3 in 1 FLUX
MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".
You will save money, save labor, and save time.

1. Fear of overheating can be forgotten.
2. Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.
3. Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.
4. Deteriorated cast iron can always be welded successfully with "York's 77".

L. W. MERCER has been elected executive vice-president of Square D Company. F. H. ROBY is vice-president in charge of sales and a director. L. G. MAECHTLEN has been elected vice-president and director.

* * *

KENNETH A. TAMMS has been named Wisconsin sales engineer for the abrasive and diamond wheel department of Manhattan Rubber Division of Raybestos-Manhattan, Inc. He succeeds ALEX WATCHORN who has covered this territory 27 years and has retired.

* * *

JOHN F. TYLER has been named assistant sales manager of the building products division of the American Welding and Manufacturing Co., Warren, O.

* * *

JOHN MIKULAK, formerly with the American Car and Foundry Company, has joined Worthington Pump & Machinery Corp. as assistant to the vice-president in charge of manufacturing at Harrison, N. J., to aid in welding operations.

* * *

LESLIE J. CARSON of the Link Belt Company has been appointed director of the machinery division of the Office of Price Stabilization to succeed ROGER MAGOUN who is returning to his job at Norton Co. Welding machinery and supplies will be handled in this division under the general and auxiliary machinery section.

* * *

WILLIAM M. HAILE, assistant midwestern manager for The Linde Air Products Co., Chicago, has been on a 3-month loan to the National Production Authority in Washington serving with the production control staff.

* * *

TOM W. NORTON has been named advertising manager of United States Steel Company.

* * *

ALONZO G. DECKER has been elected president of The Black & Decker Mfg. Co., Towson, Md., to succeed the late S. DUNCAN BLACK, who died on April 15.

* * *

LOUIS C. BEGG has been appointed district manager of the new Buffalo sales division of Ampco Metal, Inc.

* * *

JOSEPH H. ALLEN, former western district manager for THE WELDING ENGINEER, has been promoted to branch manager of the southern Pacific division of the Pacific district of McGraw-Hill Publishing Co. His headquarters will be in Los Angeles.

JOHN A. GRAHAM, JR., has been named coordinator of advertising for The Liquid Carbonic Corp., Chicago. This replaces the office of advertising manager held by BERNARD J. OOS who has resigned.

* * *

GEORGE W. MARSHALL, JR., and ALVIN F. HEINSOHN have been elected vice-presidents of Raybestos-Manhattan, Inc., Passaic, N. J.

* * *

EUGENE G. SHEASBY, formerly assistant district manager of the Pittsburgh warehouse of United States Steel Supply Company has been appointed assistant general sales manager of Fort Duquesne Steel Co., Pittsburgh.

* * *

MORSE G. DIAL has been elected executive vice-president of Union Carbide and Carbon Corp. DR. GEORGE O. CURME, JR., has been elected vice-president in charge of research of the corporation.

* * *

J. D. GUNTHER has been elected a vice-president of Air Reduction Company, Inc. He has been secretary of the company since 1946. He will be succeeded as secretary by T. STANLEY O'BRIEN III.

* * *

JAMES S. ANDERSON, assistant general sales manager of The Babcock & Wilcox Tube Co., Beaver Falls, Pa., has assumed his duties as chief of the tubing section of the Iron & Steel Division of the National Production Authority.

* * *

LUKE E. SAWYER has been elected president of The Babcock & Wilcox Tube Company. ALFRED IDDLES, formerly president, was elected chairman of the board. ISAAC HARTER, formerly chairman of the board, was named a consultant to the company. EDWARD A. LIVINGSTONE, vice president, assigned to sales was given broader organizational responsibilities.

* * *

MARK W. CRESAP, JR., management consultant, has joined Westinghouse Electric Corp., Pittsburgh, as a vice-president and assistant to President Gwilym A. Price. Mr. Cresap is a co-founder of the New York and Chicago management consultant firm of Cresap, McCormick and Paget.

* * *

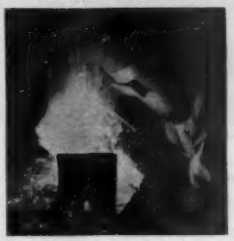
Died . . .

S. DUNCAN BLACK, co-founder and president of The Black and Decker Mfg. Co., Towson, Md., died April 15 at the age of 67.

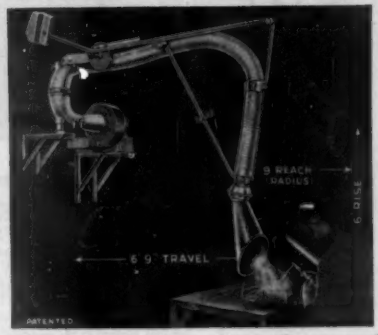
* * *

ELMER J. NOOTER, president of Nooter Corp., St. Louis, died on April 14 at the age of 42.

RUEMELIN Fume Collectors



Welding without ventilation. Note smoke and gas clouds.



(Right) Welding with Ruemelin Fume Collector.

REMOVE WELDING FUMES at the Source!

Ruemelin Fume Collectors remove smoke, gas and welding heat. Keep the shop air clean. Efficient and practical. Maximum coverage in welding areas. Your welders work better with this equipment in use. Write for bulletin 37-D describing all models.

Long reach collector extends working range of hood to 15 ft. or 18 ft. operating radius. Double swivel permits hood to work in 360° circle for full coverage.

RUEMELIN MFG. CO.

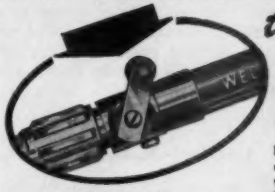
Manufacturers and Engineers SAND BLAST AND DUST COLLECTING EQUIPMENT

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

A 5896-55

for Mass Production Welding

there's no torch like the

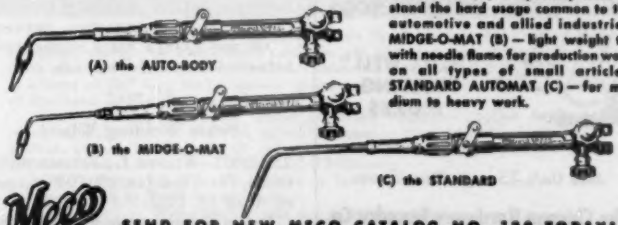


Meco AUTOMAT

The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



Meco

SEND FOR NEW MECO CATALOG NO. 136 TODAY!

Modern Engineering CO., Inc.

A Word of Thanks!

TO USERS AND DISTRIBUTORS OF OUR WELDING RODS

• In achieving the position of leadership as the country's largest manufacturer of cast iron welding rods, we wish to thank those who have placed their faith in FUSE-WELL Welding Rods and Electrodes.

We have always endeavored to supply the needs of our customers with uniform, high-quality rods; and to meet their service requirements through the country's finest distributors.

In times like this, the confidence you have in FUSE-WELL is important, and you may be sure we will continue to supply the rods, electrodes and fluxes you need to the fullest extent of our ability and production facilities.

Fuse-Well

PLAIN AND ALLOY CAST IRON WELDING RODS

ELECTRODES

•

ALUMINUM WELDING RODS

•

"FLUX-WELL" WELDING FLUXES

Sold Only Through Distributors

The Chicago Hardware Foundry Co.

"Dependable Since 1897"

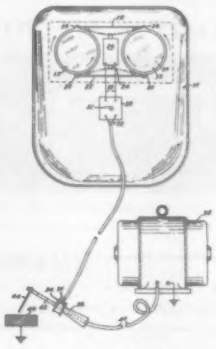
2051 Commonwealth Avenue

NORTH CHICAGO, ILLINOIS

From the Patent Office

Current Changes Welding Lens

2,548,230. CECIL PATRICK MOLYNEUX, Hampton Bays, N. Y. Assigned to Molyneux & Aspinwall, Inc., Flushing, N. Y. Filed June 27, 1946. Granted April 10, 1951.



A new arc welding helmet has eye pieces of variable light transmission and means associated with them for gradually varying the amount of light passed. This control is connected to a current-monitoring device so that the amount of light passed through the eye pieces varies with the fluctuation of welding current.

• • •

Acetylene Manufacture

2,549,240. SAM P. ROBINSON, Bartlesville, Okla. Assigned to Phillips Petroleum Company. Filed Nov. 8, 1948. Granted April 17, 1951.

Patent refers to a process for the manufacture of acetylene which includes a mixture of ethylene and hydrogen with a catalyst of titanium dioxide at a temperature between 2,000 and 2,600 F for a contact time between 0.01 and 1.0 seconds.

• • •

Seam Welding Wheel

2,548,007. WILBUR G. FITZSIMMONS, Ocala, Fla. Filed Jan. 25, 1949. Granted April 10, 1951.

Patent covers a seam welding wheel that has a number of radial chambers to receive cakes of coolant material. A closure for the chambers keeps them sealed except for one gas vent.

W-AL-CO RODS

for Welding of ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire

TYPES 25, 43 and 52

Brazing 716

FOR CAST ALUMINUM

Use Extruded Rods

Types 142, 195, 355 and 356

for Better Welding

3/16" size only

Aluminum Solder

White Metal

Welding Alloys Manufacturing Co.

744 Broad St. Newark 2, N. J.

SAVES TIME

SAVES LABOR

SAVES MONEY

NO-SPAT

THE NON-TOXIC WELDING FLUID

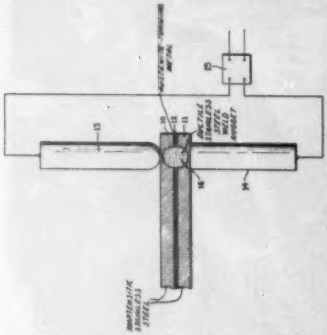
NO-SPAT eliminates slow, costly cleaning. Keeps adjoining surface spatter-free. Prevents rust, keeps welding jigs clean. No carbon monoxide. Send for FREE sample.

The Midland Paint & Varnish Co.

3803 E. 91st St. • Cleveland, Ohio

Welding Method and Product

2,544,335. GEORGE EDWIN LINNERT, Baltimore, Md. Assigned to Armco Steel Corp. Filed Feb. 25, 1948. Granted March 6, 1951.

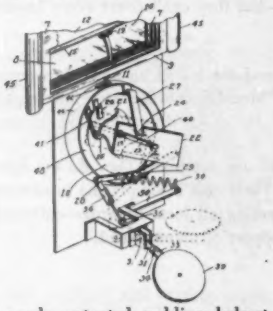


Patent refers to a method of welding 0.08% to 1.20% carbon, 11.0% to 18% chromium martensitic stainless steel sheet, strip, or the like. The method includes inserting a nickel-bearing austenite-forming shim between superimposed portions of the martensitic steel to introduce substantial quantities of austenite in the intended weld. By passing an electric welding current through the shim and steel and across their contacting surface, a welded joint is produced.

• • •

Welding Helmet

2,546,942. JOSEPH DORAN, St. Louis, Mo. Assigned to Joseph J. Doran, Barrington, Ill. Filed Nov. 22, 1944. Granted March 27, 1951.



A newly patented welding helmet comprises a head hood with a panel normally closing the sight opening through the hood. There are rotary means having a number of circumferentially placed projections on them to lift the panel. Chin-controlled means operate the rotary means. There are also means releasably holding the panel in opened position after one full movement of the chin-controlled means and retrieving the same to closed position.

SAVE TACKING TIME!
Quick-acting, positive Danly KWIK KLAMPS hold pieces firmly in place for welding . . . clamping pressures up to 750 pounds maintain precision alignment. A single motion of the lever handle clamps or releases the work, saving precious production hours.
Available in 26 sizes and a wide variety of designs, KWIK KLAMPS suit almost every application. Select the style and size for your use from the booklet illustrated below.
SEND FOR YOUR KWIK KLAMP BOOKLET TODAY!
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PRECISION DIE SETS . . . DIEMAKERS' SUPPLIES

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal — giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding — constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features — are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

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1309 S. Kilbourn Avenue Chicago 23, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

was this call necessary?

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Workmen's compensation is a fine thing—but it can't replace a mangled arm.

Safety laws prevent many accidents—but they can't cover every hazard of an individual plant.

Accident prevention which goes *beyond the law* is an unwritten responsibility of every employer. It is his "Moral Insurance" for his employees welfare.

The premiums for "Moral Insurance" are not high. They do not have to be paid for in fancy safety gadgets. Their cost is simply the institution of common sense safety regulations covering all local hazards—enforced by employee committees with the full support of management.

Yes—"plant safety" is a mutual job.

DON'T FORGET—THE LIFE YOU SAVE MAY BE YOUR OWN

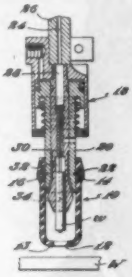
A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL

Published in the public interest by:

McGRAW-HILL PUBLICATIONS

Stud Welding Shield

2,549,804. HAROLD J. GRAHAM, Highland Park, Mich. Assigned to Graham Manufacturing Corp., Detroit. Filed Nov. 1, 1949. Granted April 24, 1951.

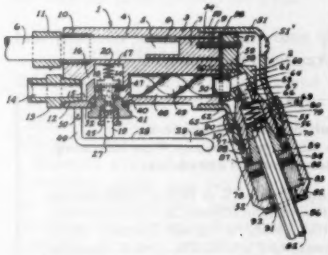


Patent describes a shield for use with stud welding equipment to isolate the welding area from the atmosphere. The shield is cylindrical and made of yieldable material and is positioned next to and around the stud. A hole in one end of the shield has a diameter greater than that of the stud but less than that of the shield. This forms a lip which contacts the workpiece when welding operations start. When the chuck moves down the shield collapses enough to let the stud go through the hole into welding contact with the metal workpiece.

* * *

Welding and Cutting Torch

2,549,360. PETER BARBECK, New York City. Assigned to Oxygen Arc Equipment Co., Inc., Brooklyn, N. Y. Filed May 22, 1947. Granted April 17, 1951.



A new welding and cutting torch has a conduit through it for passing a gas, a valve chamber next to the entrant end of the conduit and an electrode ejecting chuck at the other end of the conduit. The ejecting mechanism operates in conjunction with the chuck received within the conduit. The chuck has a gas passage through its body to admit gas to the bore of a hollow electrode secured in it. An anti-flashback formation in the conduit is placed between the valve chamber and the chuck.

An Unbeatable Combination!

SILVALOY SILVER BRAZING ALLOYS

The Silvaloy group consists of 7 popular silver brazing alloys high in tensile strength and producing strong, ductile joints on ferrous and non-ferrous metals.

	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 50	50%	1160 F	1175 F
SILVALOY 45	45%	1125 F	1145 F
SILVALOY 40	40%	1135 F	1205 F
SILVALOY 35	35%	1125 F	1295 F
SILVALOY 20	20%	1430 F	1500 F
SILVALOY 15	15%	1185 F	1280 F
SILVALOY 503	50%	1195 F	1270 F

1200 All-Purpose Flux—for use on all metals. No. 1200 Flux readily dissolves oxides during brazing operations and aids in the flowing of the alloy. Meets all government specifications.

1100 Low Temperature Flux—superior where exceptionally clean surfaces on copper or copper alloys are required at lower temperatures.

COMPLETE STOCKS

Oxy-acetelyne welding rods and flux for cast iron, steel, aluminum, brass, copper, bronze, nickel, monel and inconel.

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Get "hep" to what's new in WELDING

Quick "Brush-up" Course or Complete 16-week Course

Training films demonstrate welding techniques and theories.

This modern, non-profit school offers you all types of employee training—quick "brush-up" courses to bring trainees up-to-date on latest methods, techniques and equipment—or complete training in all phases of welding.

Equipment is the latest and best . . . training is thorough and complete . . . instructors are friendly and competent, have years of actual work experience.

Each student perfects his skill in an individual welding booth.

HOBART Welding School
BOX U-611, TROY, OHIO

Write today for literature and complete information.

Co-operating with HOBART BROS. CO. *"One of the world's largest builders of arc welders"*

"Bond purchases fill a continuing employee need . . ."

C. E. WILSON
President, General Motors Corporation

"Our Payroll Savings Plan, which was inaugurated pre-Pearl Harbor, has continued without interruption in war and peace. It is our experience that employees benefit personally as well as economically from such cultivation of the habit of thrift."

In General Motors, employees have to date purchased more than $841,000,000.00 maturity value of Bonds through the Payroll Savings Plan.

Inaugurated largely for patriotic reasons in August 1941, the plan proved so helpful in meeting an employee need that GM decided to continue it as a regular part of its employee program.

The experience of General Motors is paralleled by that of many other successful organizations. In upwards of 21,000 large companies today, more than 8,000,000 Americans are investing $150,000,000 in U. S. Savings Bonds every month.

Every Payroll Savings Plan is of direct benefit to the country, the company, and the employee. It is the one way of insuring our strength as individuals and as a free people.

Employees *want* the Payroll Savings Plan. If you do not offer your people the plan . . . or if you have not made a person-to-person canvass recently—phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will contact you to explain the simple pattern of the person-to-person canvass and supply you with application blanks, posters, pay envelope enclosures and other helpful material.

Act now—to help your employees, your company and the stability of the American economy.

Recent increases in employee participation in the Payroll Savings Plan following person-to-person canvasses:

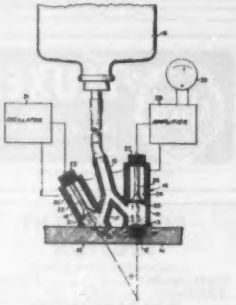
Hotpoint, Inc., Chicago, from 8.7% to 96% of 9,000 employees . . . Standard Oil of Indiana (Illinois; 26,175 employees), from 32.3% to 79.1% . . . Kelly Springfield Company (Maryland; 2,000 employees), 46.8% to 83.3% . . . A. M. Byers Co. (2,500 employees). 26% to 91% . . . Crucible Steel Company (14,500 employees) reinstatement of plan, 65%. Consolidated Western Steel Corporation (California; 7,528 employees) 9.3% to 84.8% . . . Wisconsin Electric Power Co. (3,000 employees) 44.3% to 73%.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, The Advertising Council and

McGRAW-HILL PUBLICATIONS

Sonic Weld Tester

2,545,309. REX S. ROBERTS, Belmont, Mass. Assigned to Transducer Corp., Boston. Filed May 29, 1948. Granted March 13, 1951.



A newly patented weld testing instrument includes an electromechanical transducer. Certain means provide a sonic column for coupling the transducer to a welded plate at one side of a weld. An electromechanical receiver is coupled to the same side of the weld by a sonic column. A high frequency oscillator is connected to the transducer. Indicating means connected to the receiver show the intensity of the energy reflected by the weld. The axis of the second-mentioned sonic column extends through the weld perpendicular to the surface of the plate. The axis of the first-mentioned sonic column is aranged at an angle slightly less than the critical angle at which refraction causes the energy, generated by the transducer, to proceed longitudinally through the plate towards the weld.

* * *

Metallizing Spray Gun

2,544,259. GAETANO DUCCINI and PRIMO R. CAREDIO, San Francisco, Calif. Filed Nov. 25, 1944. Granted March 6, 1951.

Recently granted patent refers to a metallizing spray gun having a pair of imperforate tubes lengthwise of the gun. They are spaced coaxially to provide an outer auxiliary passage and a central one. A tube disposed concentrically within the central passage terminates in a discharge end short of the forward parts of the passages. The tube has a number of openings along it. The interior of the tube can be connected to an exterior source of fluent spray material under pressure. A combustible operating gas under pressure is conducted to the central passage around the tube. A combustible control gas under pressure may be conducted to the auxiliary passage.

Tippy Says: **CLEOPATRA WORE A WELDED BRASSIERE!**

Tippy Says.... Take a tip, try TIPALOY!

Yes, that's right the ancient Egyptians welded metal with blow pipe and torch!

But now look how easy it is today IF you are using the right Tips . . . by this we mean, top quality, Resistance Electrodes by TIPALOY . . . NO other electrodes can give you such long life, less redressing, less mushrooming and greater current density as TIPALOY Resistance Welding Electrodes!

Write today for test samples and "the story of STRAIGHT LINE conductivity".

Tipaloy INC. 1435 EAST MILWAUKEE DETROIT 11, MICHIGAN

METAL BOND

Offers Some Aids to Profitable Welding...

★ **ALUMINUM SOLDER**
Special solder for aluminum—drawn or cast—lynite castings, and die-cast metals. Can be used with soldering iron or under direct flame—self fluxing.

★ **HARD SOLDER**
Withstands high temperatures, heavy wear, expansion, and contraction—can be flowed in at 620° F. Use with any kind of heat.

★ **NO. 10 BRAZING FLUX**
Contains Bronze Spelter—specially prepared for brazing Malleable and Cast Iron, Steel, Brass, Bronze, and Copper. Uses lower heat—less expansion and preheating—removes oxides—flows freely. Leaves no glazed surface—easily machined and finished.

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Now only $4.95 Post Paid (when paid in advance)

Sell-on-sight Bull Dog Hitches . . . the ball and socket coupler that can't let go. Heavy drop forge steel construction for trailers up to 2500 pounds. Shank diameter—1¾". Fits 1¼" pipe tongue.

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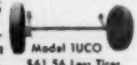

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JACK—satisfied customers bring in others. Bull Dog Jacks make easy, one-man job of parking or hitching trailers—farm implements. All steel. Heavy duty, ball-bearing swivel action. "Can't lose" crank. Complete with brackets, ready to install.

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Prevents adhesion of welding spatter on multipass welds or on single pass welds where heat is intense.

Also used to prevent the bonding of flash to dies and holder jaws of automatic welding machines in resistance welding.

Flash-Ex, a creamy white liquid is easily applied by any convenient means to parts that must be protected. Its use prevents imperfect welds by eliminating the possibility of spatter "shooting across" the jaws as when build-ups occur. The coating is very durable and permits many more welds between applications than ordinarily.

SPATTER-EX COMPOUND

Here is another time and cost saver that prevents bonding of welding spatter to parts which are to be welded.

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METAL WORKING OILS & COMPOUNDS
9800 Copeland
Detroit 17, Mich.

BUY

SELL

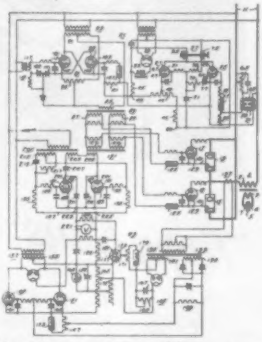
USE

SHAWINIGAN CARBIDE

SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

Welding Current Regulator

2,545,998. EDWARD C. HARTWIG, Towanda, N. Y. Assigned to Westinghouse Electric Corp., East Pittsburgh, Pa. Filed May 8, 1948. Granted March 20, 1951.

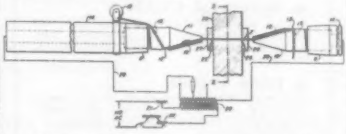


Newly patented welding current regulator consists of an apparatus for supplying a load intermittently from a source, comprising, in combination, coupling means to be applied to the load for deriving power only when the load is supplied. There are first means connected to the coupling for deriving a first potential of substantially constant magnitude. There are second means connected to the coupling for deriving a second potential which is proportional to load current and third means to be connected between the first and second means and the load. This controls the current flow through the load in accordance with the relationship between the first and second potentials.

* * *

Welding Thermoplastic Bodies

2,546,164. NEIL S. NORRIS, Valley Center, Calif. Filed Dec. 29, 1949. Granted March 27, 1951.



Patent refers to an apparatus for welding confronting surfaces of thermoplastic body portions. The combination of an electrically conductive, elongated heating member having a relatively low longitudinal heat conductivity. Conical holding means are attached to each end of the member. They have a relatively high heat conductivity with large exposed surface to facilitate cooling. The length of the member between the means is proportioned with respect to the longitudinal heat conductivity of the member.

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SODERING
BRAZING & WELDING
L. B. ALLEN CO., INC. Chicago 31, Ill.
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P 9811 Welding Engineer
330 W. 42 St. New York 18, N. Y.

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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

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IN TOP-level supervision. Fifteen years experience in design, sales, field work and fabrication of boilers, pressure vessels, and weldments. Good personality and educational background. Married, age 36, active athlete. Employed as welding superintendent. PW 9639, Welding Engineer.

PATENTS

Consultant: E. H. Polachek
Reg. Patent Attorney
1234 Broadway, New York 1, N. Y.

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IMMEDIATE DELIVERY FOR VICTOR GAS WELDERS

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Packed in lots of 100 per size. Prepaid postage to your warehouse in any city. Other sizes available upon request. Specification orders manufactured.

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Air Products
600 Cu. Ft. per Hour
(20-25 Meters)

Complete—A-1 Condition, Electric Motor Driven, Operating now—Disposing of this plant because installing larger one—Price Complete $8,500.00.

DYE OXYGEN COMPANY
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Oxygen, acetylene, or air hose, 25' length, ¼" I. D. with couplings—$2.25 per length.
Parcel Post Prepaid. Rated firms: net 10 days. Others: Cash with order or C.O.D.

Satisfaction guaranteed.

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FOR SALE

4-No. 07P02

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Medium Pressure Portable Acetylene Generators 25 lb. carbide capacity 50 cubic ft. per hr. with accessories.

Entire Equipment
New and Unused

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2,000# Type 347 bare wire 1/16, 1/32
1,200# Page 18-8 MO 3/16
400# Type 347 McKay 3/32
2,000# Alcoa 22 flux
4,000# Type 307, 18-8 MN ⅛, 3/16, ¼
4,000# Anaconda Super Nickel (70-30) 3/32, ⅛, 5/32
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2,000# Aluminum Electrodes, ⅛, 3/32, 5/32
1,000# Arcos 25-12 CB ¼, 3/64
Also 308, 310, 316, etc.

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SPOT WELDER, National, 40 KVA for Brass and Stainless.
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NO. 12 LENSES, ELECTRODE HOLDERS.

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New FREE
Bulletin

cam-lok

the new, rugged trouble-free
CABLE CONNECTOR *and* ELECTRODE HOLDER *for better low cost welding*

Greater pressure contact that really minimizes high resistance and cable heating.

Rugged, light weight holder for welding in "hard to get to" corners—no electrode bending necessary.

Mail this convenient coupon today.

cam-lok Division of Empire Products Inc.
P. O. Box 98-B Cincinnati 36, Ohio

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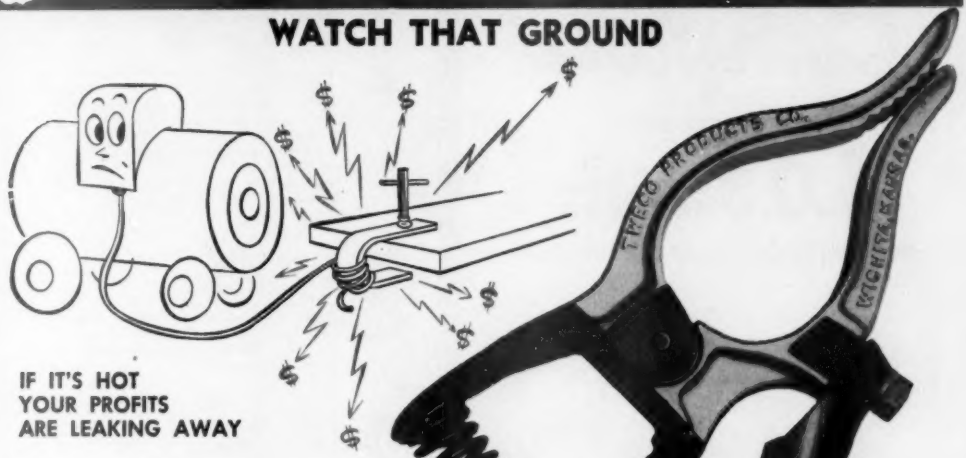
STOP WELDING LOSSES *with* **TWECO** CABLE Connections

WATCH THAT GROUND



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TWECO
GROUND CLAMPS

A BETTER GROUND CONNECTION FOR MAXIMUM WELDING EFFICIENCY

EASY ON — EASY OFF

They bite like a bulldog

Three sizes for a complete range of manual welding needs; high copper alloy construction with welded jaw shunts for maximum conductivity and efficiency. Positive grounding; strong jaw grip; easy to install bolt and clamp cable connector.

Heat is undesirable in a welding circuit except at the point of weld metal deposit. Serious loss of arc time can frequently be traced to a poor ground. Switch to TWECO ground clamps and get more profitable man-hours in your welding shop.

Write for Twecolog #8 giving data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections for electric welding

Model	Amp. Capacity	Cable Capacity	Price
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Jr.	300 Ampere	4, 2, 1, 1/0	3.00
Sr.	500 Ampere	1/0 thru 4/0	4.50

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Tweco MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING

PRODUCTS COMPANY

BOSTON AT MOSLEY • WICHITA, KAN.

SEE YOUR WELDING SUPPLY DISTRIBUTOR

Compare

AND YOU'LL BUY

A.O.Smith

the HEAVYWEIGHT CHAMP of All Welders

NO OTHER WELDER HAS ALL 7 OF THESE SUPERIOR FEATURES

A. O. Smith's Complete Line of N.E.M.A. rated *Heavy-Duty, General Purpose* and *Utility* Welders are manufactured by the world's largest user of welding as a production tool.

For higher performance with reduced cost of welding operations, put A. O. Smith Welders on your line.

Available in 300, 400 and 500 Amperes

Made by Welders . . .
for Welders . . .

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With more copper built into the coils, A. O. Smith gives you 75 *Volts* open circuit. Perfect for high resistance electrodes, low hydrogen welding, new stainless steels. Gets deeper penetration, faster, easier welding even in overhead and vertical positions. No arc booster needed! Quick starting and usable on rusty, scaly metal.

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